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Erratum.

Vol. 9. p. 797. KRUPSKI, A. E., HUNGERBUHLER, F., & ALMASY, F. (1937). for " After six days' vitamin treatment a retention of 62 g. of Ca and 54 g. of P was observed " read " After a six days' balance experiment a retention of 62 g. of Ca and 58 g. of P was observed ".

The Editor will be glad to receive publications relating to Veterinary Science and cognate subjects in order that they may be dealt with in the *Veterinary Bulletin*.

Reports of Departments, Special Reports, reprints, etc., etc., should be sent as soon as they are issued.

Books for Review.

The Editor will be glad to receive books for review in the *Veterinary Bulletin*.

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IMPERIAL BUREAU OF ANIMAL HEALTH

THE

VETERINARY BULLETIN

Vol. 11.] July, 1941. [No. 7.

DISEASES CAUSED BY BACTERIA AND FUNGI

STEVENSON, J. W., & REED, G. B. (1940). **Chemotactic Response to Staphylococcus Strains of Varying Pathogenicity.**—*J. Bact.* **40.** 239–245.

The chemotactic attraction of leucocytes for various strains of *Staphylococcus* appeared to vary inversely with the pathogenicity, *i.e.* strains producing little or no haemotoxin exhibited greater attraction for leucocytes than did strains of higher pathogenicity and toxigenic properties. There is also some evidence that the negative chemotactic action of toxin may account for this observed difference.—A. EDEN.

VERWEY, W. F. (1940). **A Type-Specific Antigenic Protein Derived from the Staphylococcus.**—*J. exp. Med.* **71.** 635–644.

A watery suspension of ground lyophilized cultures of type A staphylococcus (centrifuged from 24-hour growths in heart broth) was fractioned by mild simple chemical technique. A type-specific antigenic protein was obtained by trichloracetic acid precipitation of the supernatant fluid after centrifugation of the watery extract, first at pH 5·2 and then at pH 3·5—a preliminary procedure which removed most of the nucleic acid. It was of high nitrogen content (14·4%), almost free from phosphorus and carbohydrate, and in precipitation tests reacted in high dilution with homologous immune sera but only in low dilutions with sera of heterologous types. The type specificity was found to be entirely independent of that of the carbohydrate described by JULIANELLE & WIEGHARD [(1934). *Proc. Soc. exp. Biol., N.Y.* **31.** 947.], which was simply fractioned in the present experiments from the final centrifugate by precipitation with alcohol after removal of the trichloracetic acid by ether.
—H. H. GREEN.

SHATTOCK, P. M. F., & MATTICK, E. C. V. (1940). **Subclinical Staphylococcus Mastitis in Herds free from Streptococcus Mastitis, and its Effect upon Milk Composition.**—*J. Dairy Res.* **11.** 311–315.

During routine testing of 428 cows free from *Str. agalactiae* infection, 92 were found to harbour haemolytic staphylococci in the udder. In no instance was clinical mastitis present. Chemical changes in the composition and pH of the milk, however, did occur. These might be of importance in the preparation of milk products.

Under routine mastitis control schemes the presence of subclinical staphylococcal mastitis in a herd is difficult to detect, since in most of these schemes Edwards' crystal-violet blood agar is employed. This medium inhibits all staphylococci. Aesculin blood agar prepared with cow's blood readily shows haemolytic staphylococci. In view of the above findings its use is advocated for routine plating tests in all eradication schemes.—D. D. OGILVIE.

VAN DER SCHEER, A. F. (1940). Eenige waarnemingen over in Nederland voorkomende mastitisstreptococcen bij het rund. (Voorloopige mededeeling). **[Mastitis Streptococci as Found in Holland].**—*Tijdschr. Diergeneesk.* **67.** 76–80. [English, French and German summaries].

In this preliminary report which contains little detail, the author records the isolation from cases of mastitis in cows in Holland of *Str. dysgalactiae*, *Str. uberis* and *Str. pyogenes*. It is stated that *Str. uberis* will probably be found to belong to group E.—J. E.

HUCKER, G. J. (1939). **The Elimination of Mastitis (Preliminary Report).**—*Rep. N.Y. St. Ass. Dairy & Milk Insp., 1939.* pp. 29–34. [Also appeared in *J. Milk Technol.* **3.** 159–161. (1940)].

This is a survey based on reports of the physical examination of cows for mastitis in conjunction with laboratory tests of the milk made by examiners for milk companies, or by municipal inspectors in New York State. Over a period of five years (1934–38), the percentage of cows condemned or segregated for mastitis fell from 2·2 to 1·7 among 1,491,825 cows examined. The importance, however, of attention to general measures of hygiene and of care in applying the preventive means available is emphasized.—J. A. GRIFFITHS.

ZITTLE, C. A. (1939). **The Antigenic Structure of Hemolytic Streptococci of Lancefield Group A. IV. Nucleoprotein Components: Some Chemical and Serological Properties, and Changes in Both Caused by Certain Enzymes.** — *J. Immunol.* **37.** 1–16. [Author's summary copied *verbatim*]. [For previous parts, see *V. B.* **10.** 313].

HENLE, W., & HENLE, Gertrude. (1939). **The Antigenic Structure of Hemolytic Streptococci of Lancefield Group A. V. The Lack of Interference of Blood-Group A Substance in Culture Media with Chemical and Serological Studies on Streptococcus hemolyticus.**—*Ibid.* 149–157. [Authors' conclusion copied *verbatim*].

MUDD, S., & LACKMAN, D. B. (1940). **The Antigenic Structure of Hemolytic Streptococci of Lancefield Group A. VI. The Immunological Behavior of the Nucleoproteins Extracted at Neutrality.**—*Ibid.* **39.** 495–510. [Authors' summary copied *verbatim*].

IV. 1. Type-specific M substance has been extracted from undried, whole streptococci at 37°, 56° and 100°C. The M substance has also been extracted from the residues remaining after sonic disintegration of the organisms and extraction with saline.

2. M. is a nucleoprotein which gives color tests for ribose but not for desoxyribose nucleic acid. Millon and Hopkins-Cole reactions are negative or very weakly positive. Ribonuclease produces detectable chemical, but not serological, alteration in preparations of M. A nucleic acid obtained from M was acted on by ribonuclease.

3. The inactivation of the type-specific precipitin reaction of M by trypsin has been confirmed and shown to take place within an unusually short time; simultaneously loss of precipitability with acid has been found to occur.

4. From tryptic digests of M a substance high in phosphorus, not a protein, can be precipitated with alcohol; from the alcoholic solution a biuret-positive, low-phosphorus, non-diffusible component is obtained.

5. The action of chlorine-water on M produces an acid-insoluble substance which is no longer reactive in the precipitin test. The presence of histidine and absence of tyrosine in M suggests that histidine is the site of this reaction.

6. The action of ribonuclease and color tests indicate that the nucleoprotein agglutinogen (NPA) contains both ribose and desoxyribose nucleic acids.

7. The action of trypsin on NPA was found to be accompanied by a loss of precipitability with acid at its flocculation point. A difference was found in the action of crystalline and commercial trypsin.

8. NPA has been shown to be more complex than M since it contains both ribose and desoxyribose nucleic acids and gives positive Millon and Hopkins-Cole reactions.

V. The presence of blood-group A-substance in the culture medium usually does not interfere with the chemical fractionation of hemolytic streptococci of Lancefield's group A. However, care is required in dealing with carbohydrates. But even in these instances the actual amount of blood-group A-substance present might be small and perhaps beyond chemical detection. It is possible to remove the A-substance from the organisms by repeated careful washing.

An interference in serological work seems to be excluded since antibodies against blood-group A-substance are not formed in rabbits upon the injection of hemolytic streptococci grown in neopeptone broth. A number of the antisera are precipitated by neopeptone broth, but in no case was it possible to ascribe the precipitate to an A-specific reaction. Antisera

against encapsulated streptococci proved to be no exception.

VI. The neutral sonic extract of group A hemolytic streptococci contains at least two serologically active components ; one a nucleoprotein of broad reactivity and the other type-specific material probably related to Lancefield's " M " or " T ", or both. The qualitative reactivity of the broadly reactive protein is not affected by the presence or absence of nucleic acid.

I. LEVADITI, J., & GIUNTINI, J. (1940). Caractères biochimiques de streptocoques isolés de plaies de guerre. **[Biochemical Character of Streptococci Isolated from War Wounds]**.—*C. R. Soc. Biol. Paris.* **133.** 408–410.

II. LEVADITI, J., & GIUNTINI, J. (1940). Variations biologiques des souches de streptocoques isolées à partir de plaies de guerre soumises à l'action des dérivés sulfamidés. **[Biological Variations of Streptococcus Strains Isolated from War Wounds and Subjected to the Action of Sulphanilamide Derivatives]**. —*Ibid.* 410–413.

I. Of 12 strains of streptococci isolated from war wounds, 11 were of the *pyogenes* and the other of the *Str. faecalis* type. The biochemical characteristics of each are fully described.

II. Strains of streptococci isolated from war wounds in the course of treatment with various sulphanilamide derivatives underwent certain changes in their properties, notably in the gradual loss of their capacity to liquefy gelatin and in loss of virulence for mice. The authors could not decide whether these variations in virulence were due exclusively to the actions of the drugs or to an association between the therapeutic activity of the drugs and the increase in the body's defence mechanisms followed by an acquired anti-streptococcal immunity.—ALFRED EDEN.

MCILWAIN, H. (1939). **The Specificity of Glutamine for Growth of *Streptococcus haemolyticus*.**—*Biochem. J.* **33.** 1942–1946.

The establishment of glutamine as an essential nutrient for the growth of *Str. haemolyticus* by MCILWAIN *et al.* [*V. B.* **10.** 157.] suggested the study of a number of allied derivatives in which various groupings of the glutamine molecule were replaced by other radicals. None of the substances examined was found to be of value in supporting growth of the organism, and it thus appears that glutamine is very specific in its action. A suggestion is made, without supporting evidence, that its mode of action is that of NH_3 transference.—ALFRED EDEN.

PAPPENHEIMER, A. M., Jr., & HOTTLE, G. A. (1940). **Effect of Certain Purines, and CO_2 on Growth of Strain of Group A Hemolytic Streptococcus.**—*Proc. Soc. exp. Biol., N.Y.* **44.** 645–649.

By the use of a medium of essentially known composition, it was possible to obtain heavy, rapid growth and haemolysin production of a C203S strain of group A haemolytic *Streptococcus*. In addition to essential factors reported by other workers, it now appears that thiamin, nicotinic acid, adenine or some related purine (but not uric acid, caffeine or theophylline), and an unknown factor which may be biotin are also necessary for the growth of this strain. Studies were also made of the relation between CO_2 tension and purine requirements.—A. E.

HOFFMAN, E. (1940). Mjältbrand hos blåräv. **[Anthrax in the Blue Fox]**.—*Skand. VetTidskr.* **30.** 161–164. [English summary].

A description of an outbreak with 11 deaths in a fox farm containing about 850 blue foxes. The source of infection was the meat of a cow dead of anthrax. The foxes which died showed signs of dyspnoea before rapid death, and laryngeal oedema and an enlarged spleen were typical P.M. findings.—J. E.

MONACO, B. (1939). Influenza delle variazioni di pressione barica sulla resistenza dei conigli alla infezione carbonchiosa sperimentale. **[Effect of Low Atmospheric Pressure on the Susceptibility of Rabbits to Experimental Infection with Anthrax]**.—*G. Batt. Immun.* **23.** 573–583. [English, French and German summaries]. [Abst. from English summary].

Exposure to low air pressures decreased the resistance of rabbits to infection with anthrax. This was probably due to the injurious effect of alternating low and normal pressures.

ADORNI-BRACCESI, M. (1939). Su alcuni fenomeni di variazione del B. anthracis. **[Variations in Colony Form of *Bacillus anthracis*]**.—*G. Batt. Immun.* **23.** 551–565. [English, French and German summaries]. [Abst. from English summary].

Variations in the colony form of *B. anthracis* are described. A pure culture was obtained of a strain with catherine-wheel shaped colonies which, unlike the one described by FAVIA, was pure and stable both *in vitro* and *in vivo*. It is a virulent R type.

—. (1940). **Report of Committee on Tuberculosis.**—*J. Amer. vet. med. Ass.* **97.** 498–502.

By the end of June 1940, about 62,000,000 cattle were under co-operative supervision and all but two counties in California were " modified accredited areas ". In the eradication campaign at that time, about 230,000,000 tuberculin tests had been performed and 3,772,000 tuberculous animals had been slaughtered at a compensation cost of 188 million dollars and at an operating cost of about 86 million dollars.

During routine testing, about 0·22% of cattle were classified as " no visible lesions cases ". The causes of nonspecific false reactions are discussed; more research into tuberculin is necessary before much light can be thrown on this problem. It is necessary to continue with periodical re-testing and the enforcement of various regulations. One necessary matter which should receive attention is the disinfection of cattle trucks. It is important to control fowl TB. and with it a large proportion of cases of TB. in pigs.—J. E.

—. (1939). Rapport tuberculose-commissie. **[Report of the Tuberculosis Commission of the Netherland Veterinary Association].**—*Tijdschr. Diergeneesk.* **66.** 1014–1027.

Following an inquiry made in 1924, a new commission was established with the purpose of studying the best methods for combating TB. in Holland. The commission made the following recommendations.

The fight against the disease must be thorough and voluntary, under the supervision of veterinary officers with the collaboration of farmers and breeders. The control of milk and of meat inspection must be organized so that relevant information is given as soon as possible to the officials. The costs incurred should be met on principle not only by cattle-owners but by all the population; this point does not, however, arise in Holland because the subsidies granted by the Government are sufficient to cover the expenses.

The commission states that it is to the advantage of the breeder to declare all animals showing open lesions, even in doubtful cases, but does not advise making this declaration compulsory. It is not proposed to brand animals reacting to the tuberculin test.

More research on immunization against TB. will be carried out; BCG vaccine has not yet given definite results, but the situation has improved where this method has been applied.

The commission recommends the following measures. All animals over six months old should be tested by the intradermal method. The purchase of new animals should be made only after the tuberculin test has been made, unless a veterinary certificate can be produced. As soon as possible after testing, a clinical examination of reactor animals and of those showing some symptoms of infection should be made. The animals so examined should be marked; those showing open lesions should be specially marked, isolated, and slaughtered within eight days. The reactors should be isolated and fattened for slaughter. Young cattle should be reared in infection-free areas and fed pasteurized products. The service must be established in every province and be under centralized control. The associations of farmers will work in collaboration, the veterinary officers being their technical advisers.

—L. TOBBACK.

CORNEA, I. (1939). Studiu statistic asupra tuberculozei la animalele de abator si pe bază de tuberculinare. **[Incidence of Tuberculosis in Slaughterhouse Cattle in Rumania].**—*Thesis, Bucarest.* pp. 48. [Abst. from French summary].

During the years 1932–37, TB. lesions were seen in 25,538 (0·03%) of 8,519,077 cattle, buffaloes, and pigs slaughtered in the urban districts of Rumania. Localized TB. was more frequent (0·23%) than generalized TB. (0·07%). The incidence was 1·3% in cows, 0·08% in pigs, 0·02% in calves, buffaloes, and buffalo calves, and 0·004% in sheep. No district was completely free from TB. 878,268 milch cows were tuberculin tested during these six years, 5,908 (0·67%) giving a positive reaction. The incidence of TB. is lower in animals of the steppes than of other areas. It is considered that compulsory tuberculin testing should be adopted to eradicate the disease.

CHOUCROUN, Nine. (1940). Les lésions de la tuberculose peuvent être engendrées par une substance extraite du bacille. **[Production of Tuberculous Lesions by Extracts of Tubercle Bacilli].**—*C. R.*

Acad. Sci., Paris. **210.** 511–513.

C. attempted to explain the mechanism by which liquid paraffin increases the pathogenic power of dead tubercle bacilli suspended in it. Liquid paraffin from which the bacterial debris had been removed by centrifugation, was found [see *V. B.* **11.** 172.] to contain an active principle which sensitized healthy animals to tuberculin. A chemical substance, free from bacillary bodies, which was isolated from this oily extract, produced lesions identical with those set up by dead tubercle bacilli suspended in paraffin. A similar substance was extracted from human and bovine type tubercle bacilli, and from defatted human type bacilli. This substance, resuspended in paraffin and inoculated intraperitoneally into g. pigs in doses of 2 mg., set up typical lesions of pulmonary TB. No bacillary bodies were present in the lesions nor in the substance inoculated.

TONUTTI, E., & WALLRAFF, J. (1939). **Histophysiology of the Tubercle.**—*Beitr. path. Anat.* **103.** 78. [Abst. in *Arch. Path.* **29.** 849, copied *verbatim*].

A series of rabbits were infected by the technic of Bieling and Schwartz. They received a preliminary sensitizing injection of killed human tubercle bacilli and three weeks later an intravenous injection of living tubercle bacilli of the bovine type. During the entire duration of the experiments the animals were maintained on a normal diet supplemented with vitamin C. The histiocytes and epithelioid cells in the tuberculous lesions situated in the lungs, adrenals and elsewhere were found to contain a striking amount of ascorbic acid by the silver nitrate technic, as well as phagocytosed tubercle bacilli. In sharp contrast, the lymphocytes contained no histochemically demonstrable vitamin C.

OLIVIER, H. R., & BONET-MAURY, P. (1940). Action des radiations ionisantes sur la virulence du bacille de Koch. [**Action of Ionizing Radiations on the Virulence of Tubercle Bacilli**].—*Pr. méd.* **48.** 217–220.

By means of carefully controlled exposures to ionizing radiations various selective types of lesion can be induced in tubercle and other pathogenic organisms, thereby affecting different cellular functions. The critical amount of these radiations, sufficient to suppress the virulence of the organisms for a sensitive animal, is such that the function of reproduction is inhibited, but other vital functions such as respiration are retained. Thus it is possible to obtain living but non-virulent tubercle bacilli, and hence to realise the best theoretical conditions for anti-tuberculosis vaccination. This action of ionizing radiations under controlled conditions appears to offer a particularly profitable line of further research.—A. EDEN.

FIORI, C. (1939). Di un metodo semplice per misurare la gravità della tuberculosi sperimentale, specie nei riguardi della valutazione della virulenza. [**Method of Assessing the Severity of Experimental Tuberculosis, especially as Regards the Degree of Virulence**].—*G. Batt. Immun.* **22.** 721–731. [English, French and German summaries].

F. considers that the severity of TB. in experimental animals can be judged by the loss of weight, the nature of the P.M. lesions, and the period of survival. He suggests a method of expressing these as numerals so that the severity of the disease can be expressed as a numerical index which may be used to compare the reaction in different animals, and the virulence of different strains of the bacilli.

—U. F. RICHARDSON.

DELLA MONICA, F. (1939). Il comportamento antigene in vitro dei lipidi del bacillo tubercolare e della brucella melitense. [**Antigenic Behaviour *in vitro* of the Lipids of *Mycobacterium tuberculosis* and *Brucella melitensis***].—*G. Batt. Immun.* **22.** 655–670. [English, French and German summaries].

Extracts of *Mycobact. tuberculosis* and *Br. melitensis* in acetone, alcohol, ether, and chloroform were tested as to their power of fixing complement in the presence of tuberculous and various anti-brucella sera. Whilst the acetone soluble fraction of tubercle bacilli gave weak positive results, all the other extracts were negative. With four tuberculous sera, acetone and alcoholic extracts of *Br. melitensis* gave some complement fixation, but this was shown to be nonspecific. It is concluded that the antigenic behaviour of the lipoids does not suggest that there is a chemical relationship between these bacilli.—U. F. RICHARDSON.

KRAKOWER, C., & GONZÁLEZ, L. M. (1940). **Mouse Leprosy.**—*Arch. Path.* **30.** 308–329. [Authors' summary copied *verbatim*].

Ordinary albino mice and rats are susceptible to infection with a bacillus of mouse leprosy originally derived from a brown mouse with

the spontaneous disease. Subcutaneous, intramuscular and intraperitoneal routes of inoculation were employed. In both animals the resulting experimental disease is entirely comparable to that produced in rats by Stefansky's bacillus of rat leprosy. The lepromas in the rat and mouse differ in size, in some of their gross features and particularly in their histologic and cytologic structure. In view of the apparent greater infectiousness of the bacilli of mouse leprosy for mice as compared with that of the rat strain it is felt that there is probably some inherent biologic difference between the two.

GREENER, Averil W. (1939). **Infection of a Peacock with *Erysipelothrix rhusiopathiae* Followed by a Case of Human Erysipeloid.**—*Brit. J. Derm.* **51.** 372–376.

A case of *E. rhusiopathiae* infection in a peacock is described. Some information is given of a lesion which developed in a laboratory worker who handled tissues from the bird during the P.M. examination.

The evidence of the nature of the lesion is not complete.

DANZA, D. (1939). Sulla recettività di alcune specie di volatili al bac. Erysipelatis suis. **[The Susceptibility of Some Species of Birds to *Erysipelothrix rhusiopathiae*].** — *Profilassi.* **12.** 114–116. [French and German summaries]. [Translation of French summary].

D. carried out experiments on the susceptibility of various avian species to infection with *E. rhusiopathiae*, in order to test their value as experimental animals. Susceptible birds were found to be :– pigeons, sparrows, goldfinches, chaffinches, greenfinches, canaries, siskins, " zenzellas," thrushes, blackbirds, turtle-doves, and quail. Refractory were :– geese, ducks, chickens, magpies, owls, and turkeys. Geese, ducks, and turkeys were unsusceptible even if inoculated when young [but see also *V. B.* **9.** 522].

CERRUTI, C. G. (1939). La bile agente dissociatore del b. del mal rossino. **[Dissociation of *Erysipelothrix rhusiopathiae* Induced by Bile].**—*G. Batt. Immun.* **22.** 908–919. [English, French and German summaries].

After reviewing recent literature on the action of bile in inducing bacterial dissociation, C. records that R colonies were produced on agar plates, to which 25 % of ox bile had been added, when they were inoculated either with a normal strain of *E. rhusiopathiae*, or with a strain which had been grown in bile broth. These R colonies consisted of long filaments which were Gram negative, and had irregular margins and a shagreened surface, giving something of the " medusa head " appearance. The organisms were agglutinated by acriflavine, whilst organisms in the S phase are not affected by this reagent. When the strain from the bile-broth medium was transferred to ordinary agar plates, colonies of the ordinary S type, with regular edges and a smooth surface, developed.

—U. F. RICHARDSON.

BERKMAN, S., SAUNDERS, F., & KOSER, S. A. (1940). **Accessory Growth Factor Requirements of Some Members of the Pasteurella Group.**—*Proc. Soc. exp. Biol., N.Y.* **44.** 68–70.

A report is given of experiments in which 17 typical strains of *Pasteurella* were used to demonstrate that nicotinamide, pantothenic acid and, in some cases, the butyl factor for clostridia (probably biotin) are necessary accessory growth factors for some members of the pasteurella group. It was found that all but two of the cultures could be grown in the presence of these accessory factors when 18 amino-acids were substituted for the hydrolysed gelatin solution in the basal medium.

—R. ALLCROFT.

HEUKELEKIAN, H., & HELLER, A. (1940). **Relation between Food Concentration and Surface for Bacterial Growth.**—*J. Bact.* **40.** 547–558. [Extract from authors' summary copied *verbatim*].

For the purpose of determining the effect of food concentration and surface on the growth of bacteria, washed cultures of *Escherichia coli* [*Bacterium coli*] were inoculated into glucose and peptone medium of concentrations varying from 100 to 0·5 p.p.m. in flasks of 250 ml. capacity containing 20 ml. of the medium. To one series 50 grams of 4 mm. clean glass beads were added. The numbers of organisms were counted by the plate method after different periods of incubation.

Under the conditions of the experiment the growth of *Escherichia coli* did not take place in glucose and peptone concentrations of 0·5 and 2·5 p.p.m. The addition of glass beads to the medium at these concentrations permitted a considerable growth of these organisms. The effect of glass beads was noticeable up to

25 p.p.m. concentration of glucose and peptone. Beyond this concentration the numbers of *Escherichia coli* with and without beads were practically the same.

Surfaces enable bacteria to develop in substrates otherwise too dilute for growth. Development takes place either as bacterial slime or colonial growth attached to the surfaces. Once a biologically active slime is established on surfaces, the rate of biological reaction is greatly accelerated.

—. (1940). **U.S.A. Report of the Subcommittee of the Nomenclature Committee of the International Association of Microbiologists on the Genus** *Salmonella*. —*Rep. Proc. 3rd int. Congr. Microbiol. 1939*. pp. 832–840. New York: International Association of Microbiologists. [In English].

This is a revision of the antigenic schema of the genus *Salmonella* drawn up by the Salmonella Subcommittee of the Nomenclature Committee constituted by the First Congress of the International Society for Microbiology and published in 1934 [see *V. B.* **5.** 63]. The scheme has been simplified, and the following types or variants have been omitted :–

1. *S. senftenberg* var. *newcastle*, as this is a cultural variant of *S. senftenberg*.
2. *S. typhi-murium* var. *binns*, as this is a non-specific variant of *S. typhi-murium*.
3. *S. cholerae-suis* var. *kunzendorf*, as this is a non-specific variant of *S. cholerae-suis*.
4. *S. typhi-suis* var. *voldagsen*, as this is a non-specific variant of *S. typhi-suis*.
5. *S. thompson* var. *berlin*, as this is a non-specific variant of *S. thompson*.
6. *S. newport* var. *puerto rico*, as this is a non-specific variant of *S. newport*.
7. *S. enteritidis* var. *danysz*, as this is a cultural variant of *S. enteritidis*.
8. *S. pullorum*, as this is a cultural variant of *S. gallinarum*.

The decision with regard to *S. pullorum* will come as a surprise to many readers.

There is also a list of 38 new species recognized by the subcommittee since its first report; these include the following of veterinary interest :– *S. abonyi*, *S. abortus-bovis*, *S. newington*, and *S. onderstepoort*.

TORIHATA, K. (1938). Ueber die serologischen Beziehungen zwischen Bac. typhi, Bac. pullorum und Bac. typhi gallinarum. [**Serological Relations Between** *Salmonella typhi*, *S. pullorum* **and** *S. gallinarum*].—*Z. ImmunForsch.* **94.** 291–300.

It is known that the O antigens of *S. typhi*, *S. pullorum*, and *S. gallinarum* are the same, but T. claims that they can be differentiated by absorption tests. Experiments are described and tables are given to show that these organisms have several receptors, as follows :– *S. typhi* and *S. pullorum*, α and β specific and nonspecific receptors; *S. gallinarum*, α specific and nonspecific receptors. The differences between these three bacteria appear to be due to the specific receptors, whether α or β, and the relationship due to the nonspecific receptors.

[Before giving an unqualified acceptance it is necessary to await confirmation of these claims.]—R. LOVELL.

HAAS, R. (1939). Scheinbare Abweichungen von dem Kauffmann-White-Schema beim Gebrauch von Immunserum, das mit isoliertem O-Antigen hergestellt ist. [**Apparent Deviations from the Kauffman-White Scheme when Using Immune Serum Prepared with Isolated O Antigen**].—*Z. ImmunForsch.* **96.** 275–286.

H. examined several strains of *Salmonella typhi*, two strains of *S. enteritidis*, two strains of *S. typhi-murium*, and one of *S. paratyphi B*. Extractions were prepared by treatment with trichloracetic acid, and rabbits were immunized with the extract. Precipitins, agglutinins, and neutralizing antibodies appeared in the sera, and limited cross-reactions occurred between the sera prepared against the *S. paratyphi B-S. typhi-murium* group on the one hand and extracts of the *S. typhi-S. enteritidis* bacteria. A corresponding reverse cross-reaction also took place.

This limited cross-reaction is considered to be due to a common O antigenic factor XII, for absorption with heterologous strains indicated the specificity of the sera. It is concluded that the trichloracetic acid method of extracting endotoxins from bacteria of the salmonella group provides an accurate means of identifying the O antigen in a particular strain.—R. L.

EDWARDS, P. R., & BRUNER, D. W. (1940). **The Significance of Biological Types of Salmonella typhi-murium (Salmonella aertrycke)**.—*Bull. Ky agric. Exp. Sta.* No. 400. pp. 70.

A number of methods has been advocated to

distinguish between different strains of *S. typhi-murium*. These methods, partly biochemical and partly serological, have been designed for two purposes, first, to distinguish strains from different outbreaks and second, to correlate certain varieties with specific animal hosts.

In addition to the production or non-production of gas, four cultural types are recognized

(1). The "full" type which utilizes all sources of carbon in sodium ammonium phosphate agar and produces acid and gas from fermentable substances in testicular digest broth. This type has been found in all animal species.

(2). The "rhamnose negative" type which fails to utilize rhamnose and dulcite in sodium ammonium phosphate agar and does not ferment rhamnose in testicular digest broth. This type has been found in ducks.

(3). A type isolated from g. pigs, resembling the "rhamnose negative" type except that it utilizes dulcite in sodium ammonium phosphate agar.

(4). The "ammonia weak" type which fails to utilize any of the carbon in sodium ammonium phosphate agar or which utilizes only glucose and sodium citrate in this medium and produces acid and gas from the substances tested in testicular digest broth. This type has been found in pigeons.

The differentiation of epidemic types by serological methods has also been studied; certain strains lack the antigen V and this type has been found in pigeons. Certain cultures of *S. typhi-murium* contain an O antigenic factor I, whilst others do not; this variation is also of value.

The authors studied 391 cultures of *S. typhi-murium* derived from 180 outbreaks of disease and decided to attempt their separation into various types. Tables are given showing that the strains could be divided into 41 biological types by the test employed, and in general the authors consider that it is possible to divide this organism into types which are epidemically significant and that all cultures from a single outbreak of disease belong to the same type. The non-rhamnose fermenting strains which some European workers have associated with ducks are not prevalent in these birds in the U.S.A. Furthermore, the ammonia-weak strains which have been associated with pigeons are found only occasionally in pigeons in the U.S.A. The opinion is expressed that the lack of the antigenic factor V is a more reliable criterion for the detection of strains of pigeon origin than the failure of the organism to develop on ammonium agar.

The general conclusion from the study is that these various biochemical and serological types are significant when viewed epidemically.

—R. Lovell.

Ciani, G. (1939). Le Brucellosi in Maremma: diffusione, epidemiologia e profilassi. **[Brucella Infection in Maremma, Italy].** —*Igiene mod.* **32.** 220–248.

Recent investigations into the prevalence of undulant fever in the Maremma district of Tuscany have shown that the incidence of this condition is greater than that of the typhoid fevers. It is suggested that this is not a new development, but that previously cases had escaped diagnosis. The present paper describes the epidemiological investigations which have been undertaken, leaving the question as to the type of organism responsible to be dealt with in a future article on the bacteriological results obtained in the laboratory.

It is claimed on epidemiological grounds that the reservoir host is the sheep. The disease is more prevalent in rural than in urban populations, and is apparent mainly in tenant farmers who are not sheep owners. The majority of cases occur in adult males, and there is a marked seasonal prevalence, outbreaks commencing in January, reaching a peak in May, and then almost completely ceasing.

Attempts to trace the source of infection led to the conclusion that the majority of cases were due to the consumption of fresh cheese made from unheated sheep's milk, whilst a few cases were thought due to eating uncooked vegetables from sites contaminated by infected sheep, and other cases were ascribed to transmission of the infection by flies. Cases in veterinary surgeons and shepherds are ascribed to cutaneous infections acquired in parturition or in removing retained placentas from either cattle or sheep.

It is pointed out that nomadic sheep are brought to the Maremma area in September and taken away again in June. A first lambing occurs at the end of September and a second one in February, but the disease is not associated with the period of lambing or abortion. Cheese making commences in November, but since the incubation period is 16–20 days, few cases of human disease occur till January.

As the milk supply is greatest in May it is then that the disease becomes most prevalent. It was found that about 44% of sheep gave positive reactions to the agglutination or brucellin tests, and that infected flocks sometimes showed a morbidity of 80–98%.

Dogs, horses, cattle, goats, and fowls in contact with infected sheep gave a high percentage of positive reactions to the aggln. test and in both species of ruminants abortion commonly occurred. In examination of flocks of sheep, a test of the sheepdog's blood proved very reliable as an indication of the presence of infection. Pigs were also found to give positive reactions to the aggln. test, and to abort as the result of infection, but the disease, though spreading from pigs to sheep, did not readily spread in the reverse direction.

C. concludes that sheep serve as the principal reservoir of infection in this area, and though the other domestic animals may contract the disease they do not present the same danger to human beings. It is recommended that educational propaganda be undertaken to advise the population as to the nature of the disease, and to emphasize the danger of eating fresh cheese made from unheated sheep's milk or uncooked plants from infected pastures. It is thought that cheese is free from danger 40 days after manufacture, but it is recommended that all milk should be pasteurized, and that milk from infected flocks should be boiled. Suggestions are made for the examination of flocks, using the brucellin test, and for the isolation of those found free from infection. It is pointed out that after one or two abortions sheep appear to recover, and it is believed that such animals present little danger to man; it is suggested that the protection given by the injection of a killed vaccine may be sufficient to prevent any heavy contamination of milk or pastures. It is even suggested that attempts should be made to immunize the human population by oral administration of vaccines, as it appears that shepherds acquire immunity without developing disease symptoms.

—U. F. Richardson.

Beach, B. A., Irwin, M. R., & Ferguson, L. C. (1940). **The Significance of the "Ceased" Reactor to Bang's Disease.** —*J. agric. Res.* **61.** 75–80. [Authors' summary copied *verbatim*].

Twenty-one so-called "ceased" reactor cows in 2 herds (14 in 1, 6 in the other) were allowed to commingle with a total of 54 cows from Bang-negative herds through either 1 or 2 gestation periods for each of the normal cows. With the exception of a transitory infection in one-quarter of the udder of 1 of the ceased reactors, *Brucella abortus* was not demonstrated in any of these cows by culture or guinea pig injection at the time of calving. Moreover, none of the 54 normal cows showed evidence of having been infected by any of the ceased reactors, as evidenced by the lack of agglutinins in their sera for *Br. abortus*, except 1 individual whose serum showed a low titer (1 : 100) for the organism. This one reactor was in the same herd as the cow showing the transitory infection cited. The writers were unable to demonstrate the organism in this cow either at the time of calving or after slaughter.

The results of these experiments indicate that it is relatively safe to allow ceased reactors to Bang's disease to mingle with noninfected stock. It cannot definitely be said that a ceased reactor cannot be a carrier of *Brucella abortus*, but on the basis of these experiments, it can be stated that the probability is undoubtedly small.

—. (1939). Foreløbig melding fra Veterinaerdirektøren om resultatet av bekjempelsen av smittsom kastning pr. 31. desember 1938. [**Report of the Veterinary Directorate on the Control of Bovine Brucellosis in Norway at the end of 1938**].—*Norsk VetTidsskr.* **51.** 55–58.

Tables and graphs show the progress, up to the end of 1938, of the control work on bovine brucellosis in Norway, in the different counties as well as in the country as a whole. The new eradication scheme had then been in operation for four years.

During that time, 2,992 herds had been detected and notified as infected. At the end of the same period the control work had progressed so far that 2,882 (96·3% of the above number) harboured no positive reactors, and in 2,850 herds (95·25%) the infection was regarded as eradicated.

There remained 142 herds (4·75%) not released from official supervision. Of these, 32 (1·1%) contained no positive reactors when the last test was performed, and in 82 herds (2·7%) the eradication work was so far advanced that in all probability they would be declared free from infection in a comparatively short time. When the last test was carried out, 110 herds (3·7%) proved to contain positive reactors.

[For report of previous period, see *V. B.*

9. 525.]—J. E.

FITCH, C. P., BISHOP, Lucille M., BOYD, W. L., & KELLY, Margaret D. (1939). **Results of Blood Cultures on Seven Heifers Artificially Infected with Brucella Abortus.**—*J. Amer. vet. med. Ass.* **95.** 683–689.

Seven pregnant heifers were exposed to infection with virulent *Br. abortus* culture, and daily blood cultures and agglutination tests were made on them. The blood culture technique used was a modification of that of HARING and TRAUM [*V. B.* **8.** 565]. Citrated blood, aseptically collected and heated to 57°C. for 15 min. was distributed over about 20 serum agar slants; any contaminants entering were usually limited to two or three of the slants only.

Bacteraemia occurred shortly after exposure, at the time agglutinins were beginning to appear in the bloodstream and at intervals up to the time of parturition; in two animals it was demonstrated also after parturition. One animal showed a severe generalized infection with persistent bacteraemia following abortion. In one case, on the other hand, bacteraemia was transitory, and although the organism was excreted from the udder for three months following abortion, it was never demonstrated in the bloodstream during this period.

The period from exposure until the aggln. titre reached 1 : 100 varied from nine days to as much as 74 days (a point of importance in the control of bovine brucellosis by blood testing). Differences in susceptibility were well shown in the experiment.—H. E. H.

KARLSON, A. G., & BOYD, W. L. (1940). **Brucellosis in Horses. A Study of Five Cases without Clinical Symptoms.**—*J. Amer. vet. med. Ass.* **97.** 576–580. [Authors' summary copied *verbatim*].

Five horses that reacted to the agglutination test for *Brucella abortus* infection have been studied by bacteriologic examination of blood, urine, and feces. Complete necropsies were made on each animal and various tissues were examined for the presence of *Br. abortus*.

Br. abortus was isolated from the feces of two. Another horse developed an abscess of the withers from which *Br. abortus* was isolated. The microörganism was isolated from a lesion in the sternum of a fourth horse and from lesions in the ribs of a fifth. The microorganism could not be demonstrated in the blood stream or urine of any of the horses.

The observation that *Br. abortus* may be eliminated with the feces in infected horses leads to the conclusion that such animals may be a source of infection for cattle.

POLDING, J. B. (1940). **Brucella Melitensis Infection in the Maltese Goat.**—*J. Amer. vet. med. Ass.* **96.** 30–35.

An extract by P. from his published report [*V. B.* **10.** 496.] of work performed at the Brucella Melitensis Research Station, Malta. A description is given of *Br. melitensis* infection in mature and immature goats, period of incubation, persistence of infection, and clinical symptoms.—S. J. GILBERT.

I. NOLAN, A. F. (1940). **A Sporadic Case of Brucellosis in the Dog.**—*Cornell Vet.* **30.** 542–545.

II. KARLSON, A. G., & CLAUSEN, L. B. (1940). **Brucellosis in a Dog.**—*Ibid.* **30.** 546–547.

I. About three months after a three-year-old male Cocker Spaniel had ingested an unknown amount of flesh from horses which had been inoculated with large doses of *Br. suis*, the dog revealed systemic disturbances and an enlargement of the right testicle to about four times its normal size. The swelling appeared to be confined to the epididymus. A blood sample showed a titre of 1 : 450. The dog was treated with neoprontosil and aspirin and the testicle decreased to the normal size within a week. Two weeks after the initial attack the left testicle began to swell and eventually reached five or six times its normal size. There was a marked rise in temperature and the patient had a titre of 1 : 7,500. This time no treatment was given and although the left testicle returned to normal size in six weeks it remained in an indurated condition.

Somewhat similar symptoms were shown by a second dog which had access to animal carcasses. The right testicle attained a large size and ruptured and in this case the blood titre was 1 : 20,000 [no mention of attempts to isolate *Br. abortus* from the testicle].

No organisms were isolated from the blood in these cases.

II. This case occurred in a dog from a farm where brucellosis was present and the owner had undulant fever. The dog showed no systemic disturbances, but developed a pendulous ranula between the rami of the mandible. The blood and cyst contents both

showed a titre of 1 : 50. The cyst was removed surgically, but the contents failed to yield *Br. abortus* in culture or following g. pig inoculation. The dog was kept under observation for three months, but repeated blood cultures were negative and no clinical symptoms were shown. When the dog was later fed daily with milk containing *Br. abortus*, the organism was recovered from the blood but no other change occurred. When the dog was destroyed, no gross lesions were evident and attempts to recover the organism from the tissues failed.

—GWILYM O. DAVIES.

—. (1939). Nye forskrifter og kontrollordning om pasteurisering av melk m.v. til dyrefôr. [**Norway : New Regulations for Pasteurization of Milk Intended for Animal Food**].—*Norsk VetTidsskr.* **51.** 525–529.

The regulations apply to all parts of Norway except the three northern counties. They order that all milk distributed by milk processing plants, dairies, etc., for the purpose of feeding to farm animals must be heat-treated, either by high temperature pasteurization (over 80°C.), low temperature pasteurization (70°–72°C. for at least 15 sec.), or long time pasteurization (62°–63°C. for at least 30 min.).

Provision is made for controlling the efficiency of pasteurization, by Storch's test for the high temperature process and by continuous graphic temperature readings for the other methods. District veterinarians control the work, except in engineering matters, for which a dairy consultant is appointed.

The date of enforcement of the regulations was to be January 1st, 1940.

FITCH, C. O., & KARLSON, A. G. (1940). **An Attempt to Demonstrate a Filtrable Form of Brucella Abortus.**—*J. Amer. vet. med. Ass.* **96.** 501–502.

An investigation of SARNOWIEC's recent report that a filtrable form of *Br. abortus* may be obtained by growing the organism in the presence of tuberculin. No confirmation of Sarnowiec's finding could be obtained.

—S. J. GILBERT.

CATALANO, G. (1939). Importanza dell'eccipiente grasso nella vaccinazione antibrucellare. [**Importance of a Fatty Excipient in Brucella Vaccine**].—*G. Batt. Immun.* **23.** 688–700. [English, French and German summaries] [Abst. from English summary].

It was found that a fatty excipient increased the immunizing powers of brucella vaccine. This was possibly due to the fact that the presence of a fatty excipient allowed the vaccine to be absorbed slowly by the body.

ANGELINI, L. (1939). Contributo allo studio della differenziazione delle brucelle mediante i terreni all'uovo. [**Differentiation of *Brucella* on Egg Media**].—*G. Batt. Immun.* **23.** 38–41. [English, French and German summaries]. [Abst. from English summary].

Petragnani's medium, with thionin instead of malachite green, inhibited growth of *Br. abortus*, thus permitting differentiation between this species and *Br. melitensis*. Strains of *Br. paramelitensis* behaved like *Br. melitensis* on media with malachite green and with thionin.

I. MORALES OTERO, P., & GONZÁLEZ, L. M. (1940). **Studies on a Purified Antigen from Brucella.**—*Amer. J. med. Sci.* **199.** 810–814.

II. MORALES OTERO, P. (1940). **Brucella Infection in Puerto Rico.**—*Bol. Asoc. méd. P. Rico.* **32.** 35–39. [In English].

I. A method is described for the preparation from ground-up brucella cells of a purified brucella protein which can be measured accurately, contains a good antigen, and is of a fairly constant chemical composition. The antigen was tested on inhabitants of Puerto Rico as described in II and gave good results. No correlation was found to exist between cutaneous allergy and the agglutination, complement-fixation, and opsonocytophagic tests.

II. There is a high incidence of brucellosis among cattle in Puerto Rico. In 1929, blood samples were taken from 10% of the cattle supplying milk to San Juan ; 58% gave positive agglutination reactions. In 1939, 12% of 1,103 blood samples were positive.

The author was able to make observations on human beings who voluntarily underwent exposure to infection. Forty persons, physically fit and free from brucella infection, were divided into three groups :– 18 were fed 24-hour cultures of brucella in pasteurized milk ; 8 had infective material applied to a skin abrasion, and 14 had infective material applied to normal skin. Fourteen strains were used, ten bovine, two caprine, one porcine, and one equine classified as porcine. From these experiences the author concludes that *Br. melitensis* and

Br. suis are more pathogenic for man than is *Br. abortus*, infection taking place more readily by direct contact than by the ingestion of infected milk. All of the persons exposed to infection on normal skin remained healthy.

The bovine strains which were isolated in Puerto Rico were of very low virulence for man and laboratory animals, which probably accounts for the low incidence of the disease in human beings on the island. It is probable, however, that more cases occur than are diagnosed.

In tests made with purified brucella protein [see I] 24·7% of those coming into contact with cattle or infected material, and 4·2% of the general population of Puerto Rico, showed cutaneous hypersensitiveness. On the island of St. Thomas, where infection is not known to exist, there were no reactions to this test.

PRÉVOT, A. R. (1940). Manuel de classification et de détermination des bactéries anaerobies. **[Manual for the Classification of Anaerobic Bacteria]**. pp. 223. Paris: Masson et Cie.

A systematic description of the classification of the anaerobic bacteria. Details are given of the characters and properties of each species.

BENZONI, G. (1938). Ricerche biologiche sulla tossina del B. Perfringens. Nota I. Sull'azione della tossina del B. Perfringens negli animali da laboratorio. Nota II. Sull'azione dell'emotossina del B. Perfringens in vitro ed in vivo. Nota III. Tossina del B. Perfringens e lecitina. Nota IV. Tossina del B. Perfringens e tiroide. Nota V. Tossina del B. Perfringens e vitamina C. **[Research on the Biology of the Toxin of *Clostridium welchii* (Introduction). I. Action on Laboratory Animals. II. Action of Haemotoxin of *Cl. welchii in vitro* and *in vivo*. III. Toxin of *Cl. welchii* and Lecithin. IV. Toxin of *Cl. welchii* and Thyroid. V. Toxin of *Cl. welchii* and Vitamin C]**.—*Boll. Ist. sieroter. Milano.* **17.** 740–744, 745–753, 754–762, 813–816, 817–819 and 820–823. [German summaries].

The first part of this series consists of an introduction separate from the sub-section marked I. In this B. refers to the present state of our knowledge on the toxin of *Cl. welchii* and to the differences of opinion on the significance of the haemotoxin.

I. B. observed the effects on white mice, rabbits, g. pigs, and dogs, of graded doses of *Cl. welchii* toxins by intravenous injection. One toxin was rich in haemotoxin (α toxin or W factor), whilst the other was poor in this. The M.L.D. of the toxin for g. pigs, rabbits, and dogs was respectively 5, 25–30, 50–60, mouse lethal doses. The mouse, rabbit, and dog showed haemoglobinuria under the influence of the toxin but the g. pig did not. The skin of the g. pig was more sensitive to the necrotizing action of the toxin than that of the rabbit.

II. The red blood corpuscles of the g. pig, dog, horse, ass, rabbit, sheep, cow, and man were equally susceptible to haemolysis by toxin 377, but more resistant to toxin 187 which was relatively poor in haemotoxin and rich in ζ toxin. The r.b.c. of the rabbit, sheep, cow, and man were more sensitive to haemolysis than the cells of the other animals.

Attempts to ascertain the cause of the relative resistance of the g. pig to haemolysis were inconclusive.

III. Lecithin had an inhibitory effect on the haemolytic action of *Cl. welchii* toxin *in vitro* and on the local necrotizing action of the toxin *in vivo*. Lecithin also favoured immunity in the g. pig against *Cl. welchii* intoxication.

IV. Neither experimental hyperthyroidism in the g. pig nor thyroidectomy in the dog effected a notable change in resistance against *Cl. welchii* intoxication.

V. The administration of even large amounts of vitamin C did not influence the resistance of normally fed g. pigs to infection and intoxication by *Cl. welchii*, and did not prevent haemoglobinuria in intoxicated rabbits.—J. E.

OTTEN, L., & HENNEMANN, I. P. (1939). **Combined (Simultaneous) Immunisation against Tetanus.**—*J. Path. Bact.* **49.** 219–230. [Extract from authors' conclusions copied *verbatim*].

1. In conformity with the experience of immunisation against diphtheria, experimentally as well as in man, the development of active immunity against tetanus by formol-toxoid appears to be inhibited by the presence of a passive immunity.

2. Experimental research in guinea-pigs proves that the 3rd to the 6th week constitutes the critical period, the passive immunity becoming exhausted while active immunity has still not reached the required level.

3. With 3 injections of formol-toxoid at 10-day intervals, the first 2 followed by injection of serum after 24 hours, this gap can be bridged (with dosage as applied in these experiments), the passive immunity passing into the active without any interruption.

4. The inhibitory action of the passive immunity has to be attributed, in the first place, to the antitoxin itself, whether of heterologous or homologous origin.

5. Heterologous serum, as foreign protein, may be a non-specific inhibitory factor. A specific protein-antiprotein reaction in respect of serum may interfere indirectly, at least on repeated administration of serum.

WALKER, Phoebe H., & DACK, G. M. (1939). **Antigenic Relationships of Strains of Bacterium necrophorum.**—*J. infect. Dis.* **65.** 285–290.

Twelve strains of *Fusiformis necrophorus*, nine isolated from human ulcerative conditions and three from bovine liver abscesses, were serologically grouped by agglutination and agglutinin-absorption tests made with immune rabbit sera prepared against nine human strains and one bovine strain and with titres of 1 : 160–1 : 1,280. Results demonstrated several antigenic groups, one comprising the three bovine strains. Pathogenicity for the rabbit could not be correlated with antigenic relationship, since two virulent strains and one of low virulence were antigenically related, while two human strains and the three bovine strains were of equal virulence.—R. O. MUIR.

HERSHEY, A. D. (1939). **Factors Limiting Bacterial Growth. VI. Equations describing the Early Periods of Increase.** —*J. gen. Physiol.* **23.** 11–19. [Author's summary copied *verbatim*].

Simple assumptions have led to equations by which the latent period in multiplication and the bacterial numbers expected at any time during the phase of rapid growth may be predicted.

Experimental data obtained under rather diverse conditions have given satisfactory agreement with calculated values. Since the mathematical expressions contain no arbitrary constants, more than accidental significance must be attached to this agreement.

The hypotheses set forth appear completely to describe the early development of *Bacterium coli* and *Bacterium dysenteriae* in broth, without postulating differences other than size among individual cells, or cells obtained under different conditions.

RUBBO, S. D., & GILLESPIE, J. M. (1940). **Para-Amino Benzoic Acid as a Bacterial Growth Factor. [Correspondence].**—*Nature, Lond.* **146.** 838–839.

It has been suggested [see *V. B.* **11.** 129 and 146.] that *p*-amino benzoic acid ('p.a.b.') may be considered an essential metabolite for bacteria and that sulphanilamide inactivates an essential coenzymic grouping of the susceptible organism; this grouping is most probably 'p.a.b.' Before this hypothesis of sulphanilamide action can be accepted it must be proved that 'p.a.b.' is essential for the growth of organisms inhibited by the drug.

From the results of experiments on nine strains of *Clostridium acetobutylicum*, it is concluded that 'p.a.b.' and its derivatives act as growth factors for this organism; 'p.a.b.' can be recovered from a yeast concentrate factor as the benzoyl derivative, and removal of 'p.a.b.' from the yeast concentrate removes its growth factor activity.

WOODS' findings [*V. B.* **10.** 790.] on the anti-sulphanilamide action of 'p.a.b.' are confirmed, and it is shown that one molecule of 'p.a.b.' antagonizes 23,000 molecules of sulphanilamide. This tremendous disproportion between these two antagonistic reagents is discussed.—R. ALLCROFT.

HABERMAN, S., & ELLSWORTH, L. D. (1940). **Lethal and Dissociative Effects of X-rays on Bacteria.**—*J. Bact.* **40.** 483–503.

Studies were made of the lethal effects of X-ray treatment, with Cu and Mo targets upon various types of bacteria. A logarithmic relationship between time of exposure and percentage of cells surviving the treatment indicated that the lethal effects were proportional to the number of bacteria present at any given moment. By varying the voltage and current and consequently the wave-lengths of the X-rays, it was found that lethal action depended to a larger extent on the various wave-lengths emitted than on their intensity. Short wave-lengths were more effective in killing *Staphylococcus aureus* than longer waves of the same intensity. The dissociation rates of *Staph. aureus* and *Serratia marcescens* were increased by X-ray treatment, and the active proliferating cells showed a greater tendency than non-

proliferating cells to form dissociants after irradiation, which occasionally also produced streptococcus-like forms from *Staph. aureus*. More experimentation of this type is necessary before any prediction can be made as to the kind or number of variants that may arise after X-ray treatment, as not infrequently no changes were found.—ALFRED EDEN.

DUBOS, R. J. (1940). **The Adaptive Production of Enzymes by Bacteria.**—*Bact. Rev.* **4.** 1–16.

The enzyme characteristics of a bacterial species may be transmitted in a purely hereditary manner. On the other hand, the production of a given enzyme may be greatly increased by the presence in the culture medium of the actual substrate which it affects; this is termed adaptive production of enzymes. These enzymes reach their maximum development during the growth of the first transfer of the culture on to the specific medium, but fail to be formed immediately the culture is again transferred to a medium not containing the specific substrate. The production of adaptive enzymes involves the synthesis of new protoplasm although this production is not necessarily associated with cellular multiplication. The synthetic process appears to be controlled by the chemical nature of the substrate which thus directly determines the specificity of the enzymes. These adaptive enzymes show a very remarkable specificity towards the substrates which stimulated their production and hence may prove to be exceedingly useful tools in the solution of many biochemical and biological problems.—ALFRED EDEN.

BROWN, T. M., SWIFT, H. F., & WATSON, R. F. (1940). **Pseudo-Colonies Simulating Those of Pleuropneumonia-Like Micro-organisms.**—*J. Bact.* **40.** 857–868. [Authors' summary copied *verbatim*].

Pseudo-colonies are described resembling somewhat those formed by filterable micro-organisms, both in their morphology and in the manner in which they may be propagated on serum agar and in serum broth. Media made with sera from different animal species form pseudo-colonies characteristic for that species. The pseudo-colonies are composed largely of sphero-crystals that stain typically with fat stains. These observations extend and amplify those previously made by the Tworts and by Laidlaw.

MUSCOLINO, S. (1939). Su alcuni casi di farcino criptococcico osservati nell'asino a Messina. **[Epizootic Lymphangitis in Donkeys in Messina].**—*Azione vet.* **8.** 240–245.

In view of the fact that many authors have denied the susceptibility of donkeys to epizootic lymphangitis, 12 cases which were presented for treatment at the Institute of Clinical Veterinary Medicine, Messina, are described. Except that the infection was rather mild and easily curable by intravenous injection of bichloride of mercury (1 : 100) in doses varying from 3–10 c.c. every five days, it did not differ from that of horses and mules.

M. considers that veterinary control regulations should be extended to include the disease in donkeys.—U. F. RICHARDSON.

MOORE, M. (1941). **The Chorio-Allantoic Membrane of the Developing Chick as a Medium for the Cultivation and Histopathologic Study of Pathogenic Fungi.**—*Amer. J. Path.* **17.** 103–120.

Fifteen fungi, representative of the causative agents of various types of lesions in man, were inoculated into the chorio-allantoic membrane of the developing chick to study both the effect on the fungi and the lesions produced on the chorio-allantois. Inoculations were made directly on to the chorio-allantoic membrane of fertilized eggs incubated for 10–14 days. The pathology and histopathology of the lesions are described. The fungi grew luxuriantly on the membrane, were easily demonstrated with methylene blue and eosin, and in most cases developed within 5–11 days. The value of the chorio-allantois for the development of lesions from fungi is emphasized and the results indicate great possibilities in investigative work with fungi.—R. ALLCROFT.

FARNESS, O. J. (1940). **Coccidioidal Infection in a Dog.**—*J. Amer. vet. med. Ass.* **97.** 263–264.

F. records a case in a Great Dane in which *Coccidioides immitis* spherules were detected in the lungs. This parasite had not previously been reported in the dog, though the infection is known to occur in human beings, cattle, and sheep. The dog had been affected with rickets and was eventually destroyed on account of permanent weakness of the hind legs; no other symptoms had been observed. Autopsy showed multiple small nodules in lungs, liver, spleen, and kidneys. These resembled tuberculosis lesions, but tubercle bacilli could not be found

and sections demonstrated the *Coccidioides* spherules in the centre of the nodules. No examination was made of the brain and spinal cord, so that the relationship of the infection to the leg weakness was not established.—H. E. H.

GIORDANO, A. (1940). Studio micologico del Debaryomyces neoformans (Sanfelice) Red., Cif. et Giord. e significato della specie nella patologia animale. **[The Significance of *D. neoformans* in Animal Pathology]**.—*Mycopathologia.* **1.** 274–304. [In Italian: English and German summaries].

An account of a study of *D. neoformans.* Among the experimental animals used were dogs, in which infection was set up.

DISEASES CAUSED BY PROTOZOAN PARASITES

CRISTIANI, M. (1938). Sulla permeabilità della mucosa nasale per alcuni protozoi (tripanosomi, spirochete, spirelle). **[Permeability of the Nasal Mucosa to Trypanosomes, Spirochaetes, and Spirillae]**.—*Arch. ital. Sci. med. colon.* **19.** 416–429.

The literature on the functioning of the nasal mucous membrane as an organ of absorption and as a defensive structure is reviewed, and experiments are described on its permeability to certain protozoa. G. pigs and white rats were infected with *Trypanosoma gambiense*, *T. brucei*, *T. equiperdum*, *T. evansi*, and *Spirochaeta duttoni* by applying a drop of blood from an infected animal to the nasal mucous membrane. The resulting infection did not differ materially from that produced by subcutaneous inoculation. Attempts to infect white rats with *Spirillum minus* applied to the nasal mucous membrane were not successful.—U. F. R.

ALLEN, Ena A. (1936). **A *Pentatrichomonas* Associated with Certain Cases of Enterohepatitis or "Blackhead" of Poultry.** —*Trans. Amer. micr. Soc.* **55.** 315–322.

A. describes trichomonad forms which have been observed over a period of six years in turkeys, chickens, and guinea fowls exhibiting pathological changes resembling those of blackhead. The organism is pear-shaped and when fully extended measures 6–8μ by 9–12μ; the rounded forms measure 10–12μ in diameter. The flagella are differentiated into five anterior, made up of one short primary flagellum of varying length and four secondary flagella of equal length. A sixth flagellum runs along the margin of the undulating membrane and ends freely. A rod-like axostyle extends through the centre of the organism. There are primary and secondary blepharoplasts. The nucleus, which has a central karyosome, is placed anteriorly. When cultures obtained from the caeca of infected poults were fed to turkeys, lesions developed in the liver and two of the turkeys which succumbed showed typical blackhead lesions in the caeca. There are some interesting details concerning methods for facilitating the counting of the flagella and for the reduction of bacterial growth in cultures.—C. H. S.

CACCAVELLA, A. (1939). Nota preliminare sulle tripanosomiasi dell' occidente etiopico. **[Preliminary Note on the Trypanosome Diseases of Western Abyssinia]**.—*Riv. Biol. colon.* **2.** 223–225. [English, French and German summaries].

Glossina morsitans occurs on the plains of the Didessa river, and horses and mules have been found to be infected with *T. congolense*, and cattle with *T. brucei*, *T. vivax*, and *T. theileri*. Classically, the last-named parasite is considered non-pathogenic, but there is evidence that some strains may be pathogenic. In view of the presence of *T. brucei*, it is urged that investigations should be made as to the occurrence of human sleeping sickness, as *T. rhodesiense* is thought to be closely related to *T. brucei*. There is an area infested with *G. palpalis* close to the Kenya frontier and the limits of distribution of this fly require to be determined.—U. F. RICHARDSON.

ACANFORA, G. (1939). Tentativi di infezione sperimentale dell'embrione di pollo con *Castellanella brucei*. **[Experimental Infection of Fowl Embryos with *Trypanosoma brucei*]**.—*Arch. ital. Sci. med. colon.* **20.** 577–591. [Abst. in *Trop. Dis. Bull.* **37.** 409–410, copied *verbatim.* Signed: C. W.]

The author shows that it is possible to infect the blood of fowl embryo with *T. brucei* and that multiplication may take place, though only 5 per cent. of the attempts are successful and only if the inoculation is made between the 8th and 14th days of incubation. The trypano-

somes multiply rapidly for 3 to 4 days, proportionately to the number injected, then the number remains stationary for about 48 hours and after that the trypanosomes disappear suddenly and completely. The embryo does not always die and in some cases the parasites undergo a degenerative process before disappearing from the circulation.

AJELLO, P. (1939). Contributo allo studio delle ulcere cutanee nella leishmaniosi del cane. **[Study of Skin Lesions in Canine Leishmaniasis]**.—*Nuova Ercol.* **44.** 281–300.

Histological investigations were carried out on 14 cases of cutaneous leishmaniasis of dogs to ascertain the nature of the lesion and the relationship between cutaneous and visceral leishmaniasis. It is pointed out that leishmanial ulcers are indistinguishable macroscopically from traumatic or trophic ulcers, that they are often the only symptom of leishmaniasis observed, and that they usually occur on skin areas exposed to trauma. In dogs the ulcer is not preceded by a nodule as in human beings.

In all the cases under investigation visceral leishmaniasis was found to be present. The essential lesion appears to be an invasion of the lower layers of the skin with histiocytes, combined with degeneration and necrosis of the epidermal cells. It is concluded that cutaneous canine leishmaniasis is not a separate entity, but that the parasites with their predilection for reticulo-histiocytic tissue invade the skin and internal organs with equal readiness.—U. F. R.

ZEETTI, R. (1940). Ricerche sperimentali sul Trichomonas "Mazzanti". **[Research on *Trichomonas mazzanti* (=*T. foetus*)]**. —*Clin. vet., Milano.* **63.** 5–16, and 51–59. [German summary].

A very useful review is given of literature dealing with the methods of confirming a diagnosis of trichomonad abortion, of the staining of the parasite, its transmission to experimental animals, and the serological reaction of animals to infection. Z. records the results of his own observations which do not differ materially from those of other authorities, but it is noted that the trichomonads retain their vitality *in vitro* longer (6–15 days) at 5°C. than they do at temperatures below or much above that figure, but may remain alive up to ten days at 20°C.

The most certain way of infecting experimental animals proved to be by intraperitoneal inoculation. Female g. pigs or rabbits died as the result of such inoculation with the strain used by Z., whilst adult male animals appeared to resist infection. Intravaginal inoculation of female rabbits or g. pigs caused abortion but not death. Young g. pigs, rats, and dogs of either sex died as a result of the intraperitoneal injection of cultures or infected material from other animals.

Inoculated animals gave positive precipitin, agglutination and complement-fixation reactions to an antigen of trichomonads concentrated from peritoneal exudate, but some positive results were given by sera from control animals.—U. F. RICHARDSON.

SFORZA, M. (1939). Segnelazione di un focolaio di enteroepatite infettiva da *Trichomonas gallinarum* in Eritrea. **[An Outbreak of Entero-Hepatitis in Fowls in Eritrea caused by *T. gallinarum*]**.—*Boll. Soc. ital. Biol. sper.* **14.** 366–368.

An outbreak of entero-hepatitis of fowls, associated with the presence of necrotic foci in the liver and necrotic nodules in the caeca, was ascribed to a trichomonad which occurred in large numbers in the caecal nodules. The organism is described as occurring in a motile, oval form and a non-motile, round form, the latter being interpreted as a cystic stage. The disease could be transmitted by feeding liver emulsion. [No evidence is produced of the aetiological importance of the trichomonad.] —U. F. RICHARDSON.

JÍROVEC, O., & RODOVÁ, Helena. (1940). Ueber die Züchtung der Trichomonaden. **[Cultivation of Trichomonads]**.—*Zbl. Bakt. I. (Orig.).* **145.** 351–360.

The classical media used for the cultivation of trichomonads have consisted of a solid part (coagulated egg or serum) and a fluid part (serum or egg albumen mixed with Ringer's or Locke's solution), but such media are difficult to sterilize. Fluid media have been developed which can be sterilized by heat, but they are all rather complicated. After experimenting with various media the authors found that 5% serum diluted with modified Ringer's solution or 0·6% saline was a suitable medium for the cultivation of various trichomonads including *T. vaginalis*. The medium could be sterilized by heat without damage; it is moderately turbid, but the serum proteins are not gelatinized or precipitated as in the case of more concentrated media. The optimum

multiplication was reached in 4–5 days, and subinoculation should be carried out after seven days. Horse or human sera proved the most suitable. The addition of rice starch gave a more luxuriant growth, but was not necessary for any of the species under experiment. The covering of cultures with paraffin prolonged the survival of the organisms. Though all the species multiplied over a large range of acidity, the optimum appeared to be between pH 6·5 and 7·5. Experiments are described on the influence of various concentrations of serum.

—U. F. RICHARDSON.

HORTON-SMITH, C., TAYLOR, E. L., & TURTLE, E. E. (1940). **Ammonia Fumigation for Coccidial Disinfection.**—*Vet. Rec.* **52.** 829–832.

Experiments are described which demonstrate the powerful disinfectant action of ammonia on coccidial oocysts. Various dilutions of liquid ammonia (sp. gr. 0·880) are lethal. 1% solution kills 100% of oocysts in 24 hours, a 5% solution within two hours, and a 10% solution within 45 min. The action is due almost entirely to the toxicity of the ammonia and is independent of the pH of the solution.

Ammonia gas has a similar lethal effect. Experimentally, a concentration of 25 mg./litre destroys 100% of oocysts in one hour. A concentration of 7·7 mg./litre is equally effective if allowed to act for three hours.

Efficient fumigation of poultry houses in the field is possible if the ammonia is used at the rate of 3 oz. per 10 cu. ft. and the houses are reasonably airtight. The presence of faeces considerably lessens the concentration of ammonia which can be attained, but all oocysts exposed to the gas are eventually destroyed. The covering of houses with tarpaulins is advocated during fumigation.

—D. D. OGILVIE.

BECKER, E. R., & DERBYSHIRE, R. C. (1937–38). **Biological Assay of Feeding Stuffs in a Basal Ration for Coccidium-Growth-Promoting Substance. I. Procedure, Yellow Corn Meal, Oats, Oat Hulls, Wheat, Linseed Meal, Meat Scrap. II. Barley, Rye, Wheat Bran, Wheat Flour Middlings, Soy Bean Meal.**—*Iowa St. Coll. J. Sci.* **11.** 311–322, and **12.** 211–215.

I. BECKER and MOREHOUSE [*V. B.* **8.** 141.] showed that many foodstuffs contain a thermostable principle which stimulates the development of *Eimeria nieschulzi* in the rat. This principle they designated " coccidibios ". The present work, which is an extension of this enquiry, examines the influence of yellow maize meal, oat hulls, whole wheat, linseed oil, meat, and bone meal from the point of view of their " coccidibios " content. The results showed that whole wheat, meat, and linseed oil most favoured the development of coccidia. The coccidium growth-promoting substance was earlier considered to be vitamin B_2 but is now regarded as something distinct, though possibly related.

II. The above investigation is continued with a study of the coccidium growth-promoting properties of whole barley, whole rye, wheat bran, wheat flour middlings, and soy bean meal. Rye was found to carry a considerable amount of coccidium growth stimulant.—C. H. S.

TERZIAN, L. A. (1941). **Studies on *Plasmodium lophurae*, a Malarial Parasite in Fowls. I. Biological Characteristics.**—*Amer. J. Hyg.* Sect. C. **33.** 1–22.

There are advantages in using young chickens, rather than canaries, in certain studies on avian malaria. Two of these are that the history of the host is known, and that there is a greater volume of blood available so that daily examinations of it can be made without the risk of producing anaemia. In 1938 COGGLESHALL [*V. B.* **10.** 20.] obtained a new species, *P. lophurae*, from a Borneo fireback pheasant and succeeded in establishing it in young chickens; the parasites used in this investigation were obtained from this source and were studied in a series of 700 birds. The maintenance of the parasite in chickens presents some difficulties, and it is shown that for the degree of virulence to be retained, the intervals between successive inoculations should not exceed 6–7 days, and that intravenous inoculation (*via* the ulnar vein) should be used. Examination of the biological characteristics of the parasite confirms the description published by Coggleshall. The study of smears of liver, spleen, bone marrow, brain, and lungs of 25 birds revealed no exo-erythrocytic bodies; the length of the asexual cycle was found to be 48 hours, 30 hours being required between the merozoite's penetration of the red cell and the first division of the nucleus; in the remaining 18 hours of the asexual cycle it becomes a mature schizont. Gametocytes are produced at a rate which is proportional to the production of asexual forms so that the same balance

between them is maintained throughout the course of an infection. Little difference was found between the numbers of parasites occurring in the peripheral circulation and the internal organs, but, as infection progresses, fewer parasites are found in the bone marrow than in the blood. Finally, it is shown that there is no site better suited than any other for the developmental cycle.—C. HORTON SMITH.

JACOBI, L. (1939). Beiträge zur Pathologie der Infektion des Huhnes mit *Plasmodium gallinaceum* (Brumpt). **[Pathology of *P. gallinaceum* Infection of Fowls]**.——*Arch. exp. Path. Pharmak.* **191.** 482–491.

The experiments were carried out by intramuscular inoculation with parasitized blood of White Leghorn Fowls, 2–6 months old. The blood of the new host was found to be infected 6–22 days after inoculation. The infection proved to be most pronounced between the 9th–17th days. Acute erythrocytic and exo-erythrocytic infections were usually fatal. Birds often succumbed after receiving erythrocytic and exo-erythrocytic infections at the same time. During an acute infection the erythrocyte counts sometimes fell to one-third of the normal standard. There was a slow and steady regeneration of erythrocytes and haemoglobin. Losses in weight during the acute phase were small.—C. HORTON SMITH.

DE RITIS, F. (1940). Sul decorso dell'infezione da *P. gallinaceum* Brumpt, 1935. **[Course of *Plasmodium gallinaceum* Infection in Fowls]**.—*Riv. Parassit.* **4.** 61–68.

It was found that, in young fowls inoculated intravenously, intramuscularly, and subcutaneously with blood infected with *P. gallinaceum*, the incubation period varied according to the route of inoculation, being shortest with the intravenous route. The mortality was slightly over 50% and 66% of this mortality occurred within three weeks of infection; it was not associated with the development of parasites in the endothelial cells. In all birds which died during the fourth and fifth weeks of infection, invasion of the endothelial cells had occurred. The 38 birds which survived longer than five weeks were killed, but in only one of them was the exo-erythrocytic phase of infection detected. The administration of quinine appeared to control the erythrocytic phase of the parasite and to reduce mortality, but it did not prevent the development of endothelial invasion. The absence of exo-erythrocytic parasites in the surviving birds may be ascribed to such infections being almost invariably fatal, or to the disappearance of these forms as recovery sets in.—U. F. RICHARDSON.

CARPANO, M. (1938). Spirochetosi dei volatili in Albania. Ciclo degli spirocheti negli invertebrati ematofagi trasmettitori. **[Poultry Spirochaetosis in Albania. The Cycle of the Spirochaetes in Invertebrate Vectors]**.—*Riv. Parassit.* **2.** 165–182. [English, French and German summaries].

Avian spirochaetosis is relatively common in Albania, imported birds developing an acute infection and local birds a chronic disease, often almost symptomless. Local fowls have considerable immunity, but when these birds are inoculated with highly infected blood, spirochaetes do appear, although they may be detectable in the circulation for only a few hours. Birds which recover remain carriers of the parasites.

C. considers that the causal organism is *S. anserina* Sakharoff (1891), which he believes to be identical with *S. gallinarum* and other species described by other workers. He ascribes the slight morphological differences described (size, number of spirals, etc.) to differences in the acuteness of the infections, in the stages at which specimens were collected, and in the methods of preparation of specimens.

Acute cases display somnolence, cyanosis of the comb and diarrhoea, and chronic cases anaemia and paralysis; in all affected birds the spleen is enlarged. The symptoms and lesions, however, can only allow a doubtful diagnosis of spirochaetosis; definite diagnosis can be made if spirochaetes are detected, but subinoculation is unreliable in view of the number of carrier birds. In diagnosis C. attaches considerable importance to the detection of Macfie's granules, described as occurring in " cell inclusion " disease, as he considers that these are commonly associated with spirochaetosis.

In the examination of smears made from the contents and mucosal scrapings of the mid-guts of 15 specimens of *Argas* collected from infected fowls, bodies were found which it is suggested may represent a stage in the development of the spirochaetes. These bodies may occur as cellular inclusions, 2–10μ in diameter, with numerous chromatin staining granules in a blue protoplasmic mass. The granules may be oval, rod-shaped, round or diplococcal, and are

described as resembling the gamonts of *Theileria parva* or certain rickettsiae. Other bodies which are free in the gut contents are said to resemble the schizonts of *T. parva*. These bodies break up into unicellular organisms which may be round or oval, or similar to minute spirochaetes with tapering extremities resembling small flagella. These latter forms are interpreted as metacyclic spirochaetes and considered to be comparable to the sporozoites of the Haemosporidia.—U. F. RICHARDSON.

ROETTI, C. (1940). Studio di un focolaio importato di idropericardite infettiva dei ruminanti. [**An Outbreak of Infectious Hydropericarditis (Heartwater) in Sheep**]. —*Boll. Ist. sieroter. Milano.* **19.** 108–114. [Translation of abst. in *Zbl. Bakt. I. (Ref.).* **138.** 389].

R. studied heartwater in sheep in the region of Shoa, Italian East Africa, from the clinical, pathological, and experimental viewpoints. He demonstrated *Rickettsia ruminantium* histologically in various internal organs of the affected animals.

TARANTINO, G. B. (1939). La heart-water e la lotta contro le zecche nel governatorato dei Galla e Sidama. [**Heartwater and Tick Control in Galla and Sidama, Southern Abyssinia**].—*Riv. Biol. colon.* **2.** 335–344. [English, French and German summaries].

A general description is given of the climatic and pastoral conditions in Southern Abyssinia, which vary from humid, tropical river valleys to arid plains and mountainous uplands, and of the effect of these conditions on blood-sucking ectoparasites, the most important of which are tsetse flies and ticks. Ticks are said to be ubiquitous and therefore the tick-borne stock diseases are probably enzootic, their greatest importance lying in their effect on stock importation. Before successful importation can be undertaken a survey is necessary to ascertain which enzootic diseases are present. It is suggested that in the case of cattle much improvement can be made by local selection. Woolled and haired sheep, however, must be introduced to provide the colonists with the requisite wool and fibre, and in their introduction the most serious disease likely to be encountered is heartwater.

Outbreaks of heartwater have occurred in imported sheep, but the disease appeared so soon after arrival that infection must have been acquired in transit, and the extent of local infection is doubtful. The principal carrier, *Amblyomma hebraeum*, is widely prevalent, and nine other species of *Amblyomma* are known to occur. It is also known that heartwater occurs in the neighbouring territory of Kenya.

Grass burning, dipping, and hand dressing are discussed as measures in tick control, and it is pointed out that the first is not very efficacious and leads to soil erosion, whilst the second is too expensive for small stock, particularly when only a few head are kept by each farmer, as is recommended. Sheep cannot tolerate short-interval dipping, and as the immature stages of the tick will live on a large number of wild hosts, there would be little chance of its extermination. For hand dressing, the weekly application is recommended of waste motor lubricating oil, to each litre of which is added 1 g. arsenious oxide, 20 g. vegetable tar, and 30 g. turpentine, this being applied to the lower parts of the legs and the muzzles. It is, however, difficult to prevent ticks' attaching to the interdigital cleft, and to combat these a foot bath, containing creolin and carbolic acid, should be placed at the entrance to the sheep shelter.—U. F. RICHARDSON.

DISEASES CAUSED BY VIRUSES

I. FRENKEL, H. S., & VAN WAVEREN, G. M. (1938). Over het kweeken van mond- en klauwzeersmetstof op huidexplantaties van runder- en schapenfoetera. [**Cultivation of Foot and Mouth Disease Virus on Foetal Bovine and Ovine Skin**]. —*Versl. werkzaam. Staatsveearts. Onderzoek.-Inst. 1936–37.* pp. 22–31.

II. FRENKEL, H. S., & VAN WAVEREN, G. M. (1938). Verdere onderzoekingen betreffende het kweeken in vitro van het mond- en klauwzeervirus. [*In vitro* **Culture of Foot and Mouth Disease Virus**].—*Ibid.* pp. 32–35.

III. FRENKEL, H. S., & VAN WAVEREN, G. M. (1938). Verdere onderzoekingen in verband met het mond- en klauwzeervraagstuk. [**Research on Foot and Mouth Disease**].—*Ibid.* pp. 35–36.

IV. FRENKEL, H. S. (1938). Rapport betreffende de proeven in de praktijk genomen met het op de foetale huid van

runderen en schapen gekweekte mond- en klauwzeervirus. **[Practical Experience of the Use of Skin Tissue Culture Virus for Immunization against Foot and Mouth Disease]**.—*Ibid.* pp. 36–53.

V. Frenkel, H. S., & van Waveren, G. M. (1938). Over intracerebrale enting met mond- en klauwzeervirus bij kalveren en varkens. **[Intracerebral Inoculations of Foot and Mouth Disease Virus in Calves and Pigs]**.—*Ibid.* pp. 54–57.

VI. Frenkel, H. S., & van Waveren, G. M. (1938). Intracerebrale enting van in vitro gekweekt mond- en klauwzeervirus bij caviae. **[Intracerebral Inoculation of *in vitro* Cultivated Foot and Mouth Disease Virus in G. Pigs]**.—*Ibid.* p. 58.

I. Certain technical problems are discussed and the results of experiments are described. Bacterial contamination of tissue cultures of F. & M. disease virus can be prevented by immersing the infected skin tissue for a few minutes in 70% alcohol held at –15°C. The culture is then removed and incubated in the usual way. To eliminate air bubbles in the tissue, introduced during its preparation, the virus-tissue mixture is held in a partial vacuum for about 30 min. The virus is thus adsorbed better on to the tissue. Infected tissue culture was found to keep well for up to six days in cold storage before incubation. A test of the pH-steadying effect of $CaCO_3$ as a buffer gave unfavourable results. Minced skin tissue is normally used; experiments with unminced skin gave more unsatisfactory results. An attempt was made to obtain a heavy infection of embryonic skin for culture purposes by injecting virus into the umbilical cord of a foetus. While infection of the skin did result, the method was not sufficiently superior to be adopted in place of the usual method of using skin cuttings.

II. Further points of detail are discussed. Bovine amniotic fluid was found suitable but is not recommended, for tissue culture work in place of Tyrode's solution. Horse serum was unsuitable. Foetal serum gave good results with skin from the same animal. G. pig and rat sera did not give good results, neither did milk nor Robison's fluid.

Calf foetuses with a spine length of about 30 cm. gave the skin best suited to tissue culture. Good results were also obtained with goat foetus skin. Hoof matrix from adult cattle was usable as tissue culture material, but mucous membrane of the tongue could not be sufficiently sterilized. Chorion and foetal placenta used as tissue cultures survived only for nine days. The skin of fowl embryos was of no value. A list is given of substances which favour tissue culture growth. The pH of virus cultures tends to fall to about 6·4 after two days; it can be kept above 7·4 by the addition of buffer phosphate, and at this point virus multiplication is favoured. The blowing of air through the fluid part of tissue cultures also kept the pH on the alkaline side and favoured virus growth. There was no advantage in lowering the incubation temperature from 37° to 32°C.

III. To test whether there is justification for a farmer's belief that pregnant animals are resistant to F. & M. disease, five g. pigs in late pregnancy were infected in a hind pad; all sickened and aborted. Three non-pregnant rabbits proved to be completely resistant to infection. Infected tissue cultures, tested for viability, were still virulent after seven months in cold storage but not after 11 months.

IV. The disease appeared in July 1937 in southern Holland and was identified as type O infection. For control purposes an attempt was made to produce immune serum from cattle artificially infected with culture virus. A potent antiserum was produced, but it became impossible to prepare enough for the needs of the country, which became heavily infected; maps are given to show the incidence of the disease. Convalescent blood was then obtained from farm cattle [details given] and employed with culture virus to immunize cattle under threat of infection. Some 1,000 cattle were so treated with good results, though there were some complications and deaths. A copy of regulations given to the farmers is printed in full; these prescribe that the byres must be kept clean, the feet washed and painted twice a day with 10% Tinct. Iod. and the teats and the milker's hands washed in 0·5% caustic soda before milking.

About 300 cattle were vaccinated by culture virus alone, also with good results. Various doses of virus were used, ranging from 0·2 c.c. of a 1 : 10 dilution to 0·02 c.c. of a 1 : 5,000 dilution.

V & VI. Experiments on six calves and eight pigs showed that the intracerebral injection of virus is not followed by any local or general reaction. The injection seemed to have an immunizing effect, as all the test animals resisted intradermal infection 1–2 weeks later.

G. pigs were almost as refractory, showing

no reaction, or else giving signs of local inflammation followed by recovery. They were partially immune against intradermal reinfection.—J. E.

WYSSMANN, E. (1940). Zur Frage der Pockenimpfung (Vaccination) gegen Maul- und Klauenseuche. **[Immunization against Foot and Mouth Disease with Pox Vaccine]**.—*Schweiz. Arch. Tierheilk.* **82.** 253–264. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 359].

W. speculates on the relationship of pox to F. & M. disease and refers to cases in which it appeared that pox lymph inoculated into cattle conferred some immunity against F. & M. disease. Other observations do not support this theory. W. infected 381 cattle with pox lymph during the recent epizootic of F. & M. disease [in Switzerland], but no immunity against the latter disease resulted.

SFORZA, M. (1938). Ricerche ed esperimenti sull'indice refrattometrico del sangue della peste bovina con speciale riguardo alla iperimmunizzazione dei siero-produttori. **[The Refractometric Index of the Blood in Rinderpest with Special Reference to the Hyperimmunization of Serum Producers]**.—*Arch. ital. Sci. med. colon.* **19.** 462–481.

The only method of testing the potency of rinderpest antiserum is the biological assay in calves, but this is unsatisfactory as the result is not obtainable for 2–3 weeks, calves of known susceptibility are difficult to obtain, and concurrent disease or climatic conditions may make the test unreliable. Immunization has the effect of modifying the protein composition of the blood by increasing the fibrinogen and globulin and decreasing the albumin, and as the refractive index largely depends upon the protein constituents, an investigation was undertaken to ascertain whether its determination would give any guide to the potency of sera and to the value of animals as serum producers. For these investigations a dry Zeiss refractometer was used, and the figures given in the tables are those shown on the instrument scale and not the true refractive index.

In calves doubly inoculated against rinderpest a high reading of the refractometer combined with a high temperature indicates probable recovery, but when a high temperature is accompanied by a low refractometric reading the prognosis is bad. Cattle undergoing hyperimmunization at the Asmara institute are injected three times with virulent blood in quantities of 0·5 l., 2 l., and 4 l. at intervals of about three weeks; after an interval of 15 days they are bled once a week for four weeks and then rested. Refractometric readings are taken before hyperimmunization commences and after the various injections and bleedings. A small-scale test gave some indication that serum from an animal with a high reading was more potent than that from an animal with a low reading. It is suggested that individual animals vary in their response to hyperimmunization, the best serum producer being an animal in which the refractometric reading rises with the virulent blood inoculations, does not fall much after bleeding, and rapidly returns to normal or to higher than normal. It was noticed that in animals in which abscesses are produced as the result of the virus inoculation, the antibody production appeared to be unsatisfactory.

[Sera from two animals only were tested to ascertain whether the refractometric readings gave an indication of potency. The correlation might have been purely accidental, and the assumption on which the other suggestions are based cannot be accepted until further evidence is presented.]—U. F. RICHARDSON.

CILLI, V., & SFORZA, M. (1939). Sopra alcune caratteristiche biologiche del *virus* neurotropo della peste equina. **[Biological Characters of African Horse Sickness Neurotropic Virus]**.—*Boll. Soc. ital. Biol. sper.* **14.** 517–518.

In attempting to produce a neurotropic strain by passage of horse sickness virus subdurally through g. pigs, the authors observed that at the 47th passage, g. pig infection was produced at a dilution of 1 : 20,000. With an increase in the number of passages the virulence of the virus for g. pigs increased. In one strain at the sixth passage, and in the other at the 17th, mules recovered readily from the infection. The virus could be kept for six months, and less certainly for nine months at 7°C. in a solution consisting of equal parts of normal saline and glycerin. At room temperature it was still infective after 58 days in glycerin + saline, but in 1 % phenol it was killed in 13 days.
—U. F. RICHARDSON.

STEIN, C. D., LUCKER, J. T., OSTEEN, O. L., & GOCHENOUR, W. S. (1939). **Studies on**

the Possible Rôle of Endoparasites in the Transmission of Infectious Anemia.—*J. Amer. vet. med. Ass.* **95.** 536–541.

The authors carried out experiments which showed that mature worms of the genus *Strongylus*, collected from horses affected with infectious anaemia, contained the virus of this disease. Normal horses, when injected with a saline extract of the washed and macerated bodies of these worms, contracted the disease. That the virus was absent from the external surface of the strongyles was shown by the failure of saline washings to transmit the disease. Extracts from cylicostomes and bots failed to produce the disease on injection. In order to find out whether virus present in adult strongyles and cylicostomes could pass through their eggs and occur in the resulting larvae, two horses were injected subcutaneously with extracts of third stage larvae from the faeces of infected horses, and one was given large doses of larvae *per os*, but none developed E.I.A.—R. Fisher.

Gates, W. L. (1940). **Equine Infectious Anemia (= Swamp Fever).**—*J. Amer. vet. med. Ass.* **96.** 195–199.

This disease is of particular importance in the Mississippi delta where it is established among mules. It is most prevalent in poorly drained areas and occurs from May-October. Natural infection is probably by contamination with infected secretions, excretions, and instruments. It may also be transmitted mechanically by biting flies. The symptomatology, lesions, and control methods are discussed.—R. Fisher.

Biester, H. E., & Schwarte, L. H. (1940). **Studies on Equine Encephalomyelitis in Iowa During 1939.**—*J. Amer. vet. med. Ass.* **96.** 719–723.

The possible existence of the Eastern type virus of E.E. outside the relatively narrow coastal zone in eastern U.S.A. prompted the authors to type strains of the virus isolated from field cases in Iowa. During 1939, one squirrel and 32 horse brains from suspected cases were examined. Seventeen of the horse brains showed histological evidence of the E.E. virus, the lesions being constantly present in the anterior cord, medulla, pons, olfactory, optic, and piriform lobes and in the hippocampal region. From eight of the histologically affected cases, virus of the Western type was recovered; seven other histologically positive brains were contaminated and recovery of the virus was not possible. The 17 histologically positive cases occurred in unvaccinated horses. In eight unvaccinated horses, no evidence of virus infection was found; one case of mouldy corn poisoning and one of a teratomatous cyst in the cranial cavity were included in this group. Seven suspected brains from vaccinated horses were examined, but no evidence of virus infection was found in them. The clinical symptoms in these cases were said to resemble those of E.E., and the P.M. findings for one of these cases are given in detail. The cause of death was undetermined, and the authors recommend that research should be made on this type of case in order to aid the differential diagnosis of E.E.—N. J. Scorgie.

Lambert, W. V., Speelman, S. R., & Osborn, E. B. (1939). **Differences in Incidence of Encephalomyelitis in Horses.**—*J. Hered.* **30.** 349–352. [Authors' summary copied *verbatim*].

Statistically significant group differences in resistance to encephalomyelitis that were observed in an epizootic occurring in 1938 in the stud of horses at the U.S. Range Livestock Experiment Station are reported. A greater percentage of horses of Nonius breeding were affected than those of other breeding. Among all yearlings 50·0 per cent of Nonius breeding were affected, whereas only 11·1 per cent of the yearlings of other breeding were affected. In the foals the corresponding percentages were 72·7 and 10·5. The differences observed were not attributable to the location of the horses on the station, their distribution being such that all groups had equal opportunity to be exposed to the disease.

The data confirm previously reported observations on age differences in resistance, the younger animals being the more susceptible. No differences in resistance were observed between males and females. Possible reasons for the differences observed are discussed.

Bishopp, F. C. (1939). **Mosquito Transmission of Encephalomyelitis, or Brain Fever, of Horses.**—*J. Wash. Acad. Sci.* **29.** 495–501.

Cattle, sheep, rabbits, g. pigs, rats, mice, pigeons, ducks, and monkeys are susceptible to artificial infection with E.E., and pheasants and wild pigeons have been found naturally infected. The authors describe the condition in the horse and in man, and review the work

which has been done in connexion with its transmission. Eight species of mosquitoes have been proved, experimentally, to be capable of acting as vectors. Of these *Aëdes aegypti*, *A. sollicitans*, *A. albopictus*, *A. dorsalis*, *A. nigromaculis*, *A. taeniorhynchus* and *A. vexans*, have transmitted the Western type of the virus, *A. cantator* the Eastern type, and *A. sollicitans* both types. Although infective mosquitoes have not been found to occur naturally, and many attempts to transmit the disease with these insects have failed, circumstantial evidence, as well as experimental results, points strongly to mosquitoes as carriers; it is therefore suggested that action should be taken against mosquitoes and protection afforded to human beings and horses from them and other biting insects.—J. R. LAWSON.

ANON. (1940). **A New Vector of Equine Encephalomyelitis Virus.**—*J. Amer. vet. med. Ass.* **97.** 438–439.

A note on the paper by KITSELMAN & GRUNDMANN [(1940). *Tech. Bull. Kans. agric. Exp. Sta.* No. 50—not yet received.], announcing the isolation of E.E. virus from a naturally infected reduviid bug, *Triatoma sanguisuga*, and transmission of the disease by infected bugs to susceptible g. pigs. The insect is indigenous to E.E. areas, ranging from Maryland and New Jersey west to southern Illinois and southwest to Florida, Texas, and Panama.—J. R. LAWSON.

KUBES, V., & RÍOS, F. A. (1939). Datos preliminares sobre el agente etiológico de la encefalomielitis infecciosa de los equinos en Venezuela. [**The Causal Agent of Equine Encephalomyelitis in Venezuela**]. pp. 12. Caracas, Venezuela: Ministerio de Agricultura y Cria. [8vo].

E.E. has been recognized in Venezuela since 1936. The authors made a study of its aetiology, and state that the causal agent is a virus which differs from that of the Argentine form of the disease and also from the Eastern and Western U.S.A. types. They prepared vaccines from Argentine, Eastern and Western U.S.A., and native viruses and found that only the last produced satisfactory immunity. The virus was cultivated on chick embryos.—M. W.

KELSER, R. A. (1940). **Prophylaxis in Equine Encephalomyelitis.**—*Cornell Vet.* **30.** 350–358.

An account of the measures employed in the U.S. army for the control of E.E., with special reference to the use of vaccine. In 1938, the incidence in army horses was markedly lower than that in civilian horses (2 per thousand as compared with 23 per thousand), despite the fact that the encephalomyelitis season coincides with the army's field manoeuvres, thus subjecting the horses to greater risk from the disease than if they were kept at their home stations. Forty cases of E.E. occurred among animals of the regular army in 1938, 16 of these being fatal. Two of the deaths were in stallions, 700 of which had been vaccinated with the now discarded brain-tissue type of vaccine.

The preventive measures taken at home stations include: prohibition of entry of civilian animals, and campaigns to control and eliminate mosquitoes and flies. On manoeuvres, routes of march and camp sites were selected as far as possible in the light of information received from district veterinarians as to the situation of the disease in their respective localities. In picket lines, insecticides and smoke screens were operated. Where the disease did occur in army horses, vaccination of all in-contact animals with chick-tissue vaccine was immediately undertaken. K. believes that these measures were largely responsible for a low incidence of E.E. being maintained in army horses during 1938.

During 1939, chick-tissue vaccine prepared in the laboratories of the army veterinary school was used on a fairly extensive scale, and no case of the disease occurred among 35,000 animals given two subcutaneous injections. K. stresses the importance of using freshly prepared vaccine if maximum immunizing power is to be obtained. Strict aseptic technique must be followed in carrying out the injections; if this is not done severe local and general reactions, even death, may occur. Intramuscular vaccination is not recommended. No reactions of any consequence occurred amongst army horses, a finding at variance with the numerous severe reactions reported by civilian veterinarians. K. considers that the most potent vaccines are those prepared from strains of the virus recently isolated from horses and that the immunizing value of the vaccine is decreased if the virus is propagated too long in chick-tissue culture.—N. J. SCORGIE.

SCHOENING, H. W., SHAHAN, M. S., OSTEEN, O. L., & GILTNER, L. T. (1940). **Studies on the Intradermal Method of Vaccination Against Equine Encephalo-**

myelitis.—*Vet. Med.* **35.** 377–380.

Owing to the severe reactions which sometimes follow the subcutaneous or intramuscular inoculation of horses with two doses of E.E. chick embryo vaccine, the authors investigated the possibilities of using the intradermal route. This paper reports the results of comparative tests to determine whether a practical immunity could be produced in horses by intradermal vaccination. The vaccines used were commercially prepared from the Western type virus, and were previously reported to have caused severe reactions when given subcutaneously. A preliminary trial with g. pigs indicated that intradermal vaccination produced at least as good an immunity as subcutaneous vaccination. In horses, vaccine injected intradermally in amounts of 0·5–1 c.c. produced a better immunity than the same vaccine in similar amounts given subcutaneously. It was also established that the immunity produced by intradermal injection of two 1 c.c. doses at a week's interval was as good as that produced by two 10 c.c. doses given subcutaneously. The reactions following inoculation are summarized as follows. Of 20 horses injected intradermally, 18 had been vaccinated in the previous year; none of this group showed any untoward reaction. Of 20 horses injected either subcutaneously or intramuscularly, ten had been vaccinated in the previous year; of these ten horses, six developed large swellings at the site of inoculation. Of the ten not vaccinated in the previous year, one developed a similar swelling. It will be observed that the majority of severe reactions occurring when the vaccine was given subcutaneously were in horses which had been previously vaccinated.—N. J. S.

I. Taylor, A. R., Sharp, D. G., Finkelstein, H., & Beard, J. W. (1939). **Macromolecular Components of Chick Embryo Tissue Diseased with the Virus of Equine Encephalomyelitis.**—*Proc. Soc. exp. Biol. N.Y.* **42.** 462–464.

II. Sharp, D. G., Taylor, A. R., Beard, Dorothy, Finkelstein, H., & Beard, J. W. (1939). **Macromolecular Component of Chick Embryo Tissue Diseased with Western Strain Equine Encephalomyelitis Virus.**—*Ibid.* 790–792.

III. Taylor, A. R., Sharp, D. G., Finkelstein, H., Beard, Dorothy, & Beard, J. W. (1940). **Improved Sequence for Rapid Consistent Purification of Equine Encephalomyelitis Virus Protein.**—*Ibid.* **43.** 648–650.

IV. Sharp, D. G., Taylor, A. R., Finkelstein, H., Beard, Dorothy, & Beard, J. W. (1940). **Immunization with Non-Infectious Formalin Derivative of Purified Equine Encephalomyelitis Virus Protein.**—*Ibid.* 650–652.

I. When chick embryo diseased with E.E. virus (Eastern strain) is minced and extracted with 0·45% NaCl in 50% aqueous glycerol, a component having $S_{20}° = 250 \times 10^{-13}$ can be isolated by differential ultracentrifugation of the extract. Extraction with water followed by ultracentrifugation yields a component having $S_{20}° = 70 \times 10^{-13}$. Both have infectivities of 10^{14} mouse units/g. A component of $S_{20}° = 70 \times 10^{-13}$ can be isolated from undiseased tissue, but not a component having $S_{20}° = 250 \times 10^{-13}$.

Formol-treated diseased tissue extracted with water, or formol treatment of aqueous extracts on fractionation give a component, $S_{20}° = 70 \times 10^{-13}$, which is highly antigenic and protects g. pigs against virus injected intracerebrally. Material prepared similarly from undiseased tissue has no immunizing properties.

II. A macromolecular infective component can be isolated from saline extracts of diseased chick embryo tissue by differential ultracentrifugation, the infectivity being 10^{13} mouse units/g. Though differing serologically from the Eastern strain the component has the same sedimentation constant $S_{20}° = 273 \times 10^{-13}$ cm. sec.$^{-1}$. In solutions containing less than 0·05 *M* NaCl this component is absent but a material $S_{20}° = 70 \times 10^{-13}$ appears, which may account for the high infectivity of ultracentrifuge-fractionated water extracts of diseased chick embryo.

III. A material showing greater homogeneity in the ultracentrifuge is obtained by the extraction of diseased chick embryo with mammalian Ringer in place of 0·9% NaCl or buffer solutions, coupled with sedimentation at pH 6·5 [see II].

IV. Changes in infectivity and sedimentation behaviour of purified virus on treatment with formaldehyde are described. Non-infective, formaldehyde-treated virus produces immunity when injected subcutaneously, and is probably of the same nature as the immunizing material from formaldehyde-treated crude vaccines.

[The sedimentation velocity of a substance, in addition to being a function of the gravita-

tional field, is affected by the density and viscosity of the solvent. These properties are dependent on the temperature and buffer salt content of the solvent. It is usual to correct measurements to the conditions of viscosity and density obtaining in pure water at 20°C., in order that comparable values may be obtained.

The symbol $S_{20}°$, is the sedimentation constant, and indicates the sedimentation velocity in unit gravitational field for a substance sedimenting in pure water at 20°C. The sedimentation constant which is usually given in units of cm. sec.$^{-1}$ $\times$ 10^{-13} is proportional to the size of the high molecular substance.

For further details consult SVEDBERG and PEDERSEN. (1940). "The Ultracentrifuge". Oxford: The Clarendon Press.]—R. A. K.

SCHLOTTHAUER, C. F. (1940). **The Susceptibility of Guinea Pigs to Equine Encephalomyelitis Virus Inoculated Through Various Routes.**—*J. Amer. vet. med. Ass.* **96.** 490–492.

This report confirms that the intracerebral route of inoculation of an adequate dose of E.E. virus produces 100% infection in g. pigs. The relative efficiency of other inoculation routes expressed as a percentage of infections to exposures was :– foot pad 72·2, intracutaneous (nose), subcutaneous, intraperitoneal, and intralingual 44·4. Only one out of eight g. pigs contracted the disease as the result of contact exposure.—N. J. SCORGIE.

BRESLICH, P. J., ROWE, P. H., & LEHMAN, W. L. (1939). **Epidemic Encephalitis in North Dakota.**—*J. Amer. med. Ass.* **113.** 1722–1724. [Abst. in *Arch. Path.* **30.** 819, copied *verbatim*].

Twenty-three instances of acute epidemic encephalitis have occurred [in human beings] in North Dakota. This type of disease had not previously been observed in North Dakota. Clinically it resembled the St. Louis type of acute encephalitis. Pathologically it differed from the St. Louis type in that foci of demyelination occurred in the basal ganglions, pons and medulla oblongata. Serum from only 1 of 6 patients who recovered neutralized the virus of St. Louis encephalitis, while serum from 4 of these 6 patients neutralized the virus of western equine encephalomyelitis. The virus of lymphocytic choriomeningitis was not neutralized by serum from these 6 patients.

FARBER, S., HILL, A., CONNERLY, Marion L., & DINGLE, J. H. (1940). **Encephalitis in Infants and Children Caused by the Virus of the Eastern Variety of Equine Encephalitis.**—*J. Amer. med. Ass.* **114.** 1725–1731.

Eight cases of encephalitis in children caused by the Eastern type of E.E. virus are clinically described.—J. E.

FOTHERGILL, L. D., HOLDEN, Margaret, & WYCKOFF, R. W. G. (1939). **Western Equine Encephalomyelitis in a Laboratory Worker.**—*J. Amer. med. Ass.* **113.** 206–207.

Reference is made to human cases of infection with E.E. virus and to work done to identify the virus in these cases. The authors received reports of several cases of encephalitis among farmers during the 1938 epidemics of E.E. in horses, and they suggest that some of them were due to Western type virus.

The circumstances are reported in which the death occurred of a laboratory worker infected with Western type virus with which he had been working. The cause of death was proved by typing to be Western E.E. virus.

WYCKOFF, R. W., & TESAR, W. C. (1939). **Equine Encephalomyelitis in Monkeys.**—*J. Immunol.* **37.** 329–343. [Authors' summary copied *verbatim*].

Most young rhesus monkeys are susceptible to the nasally instilled viruses of Eastern and Western encephalomyelitis. Recovery was never observed in young animals after nervous symptoms had appeared but an occasional animal had a symptomless infection resulting in a high concentration of circulating antibodies.

Young monkeys have succumbed to the intralingual injection of virus of Eastern encephalomyelitis. In a few trials no encephalomyelitis was produced by the intravenous or subcutaneous inoculation of massive doses of either Eastern or Western virus. Such inoculated monkeys, however, developed circulating antibodies after about two weeks. The concentration of these antibodies has been greater after intravenous than after subcutaneous injection; it has remained high for months at least. Dropping virus into the eye has not resulted in either disease or appreciable production of antibodies. Two monkeys have been fed virus by stomach tube without subsequently becoming paralyzed and within our experience no healthy animal has contracted

disease after being caged with the sick and dying.

Hyperimmune horse serum, given at the time of first symptoms (fever), or later, has been without beneficial influence upon the course of either Eastern or Western disease. Injected before exposure it has provided a strong passive protection against infection from nasally instilled virus. Approximately half the animals given serum within a day after infection with virus have failed to develop disease but none of these survivors has been protected from a second exposure several weeks later.

Vaccination with formalinized chicken embryo-vaccine has in most instances protected monkeys from subsequent infection with nasally instilled virus. The antibody-response to Eastern vaccine is readily studied. The titer resulting from vaccination depends on the animal; it reaches its maximum within two weeks after injection and is not enhanced by subsequent intranasal exposure to virus. Though nearly all the immune animals have developed a rich supply of antibodies a few monkeys have succumbed to virus in spite of their antibodies. Multiple vaccination is desirable but a single vaccination will protect against Eastern virus given intranasally after a month. This result has been obtained with the crude commercial vaccines and with vaccines after clarification or deformalinization.

BOYNTON, W. H., WOODS, Gladys M., & WOOD, F. W. (1940). **The Rôle of the Veterinarian in Effective Immunization Against Hog Cholera with Tissue Vaccine.**—*J. Amer. vet. med. Ass.* **97.** 427–430.

The failures which occur with the serum-virus method of immunization against swine fever are frequently attributed to the impotency of the serum or to the inactivity of the virus, whereas these products are in fact usually potent and active, the failures being due to administration under dangerous and unsatisfactory conditions. The use of the tissue vaccine is associated with a much greater degree of safety. This vaccine consists of a suspension of finely ground virus tissue collected from pigs in the acute stages of infection, the infectivity of the virus being destroyed by the use of eucalyptol, while the immunizing properties are retained. The dose for pigs of all ages is 5 c.c., but vaccination should not be carried out until at least two weeks after weaning. The authors describe the measures which should be adopted for the production of successful results and stress the necessity for correct diagnosis and for observing aseptic and sanitary precautions during and after vaccination.—J. R. LAWSON.

POKORNY, V. (1940). Virusseuchen bei Schweinen. **[Virus Diseases of Swine].**—*Zvěrolék. Obz.* **33.** 24–25. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 385].

P. suggests that porcine paralysis [porcine encephalomyelitis] has an aetiological connexion with swine fever, as outbreaks which he has seen have followed outbreaks of S.F. or have followed the introduction of purchased pigs into the herd.

[The evidence for this suggestion is not given in the above abstract; the original publication is not at present available in the United Kingdom.]

DIERNHOFER, K. (1940). Die ansteckende Schweinelähmung. **[Porcine Encephalomyelitis].**—*Dtsch. tierärztl. Wschr.* **48.** 213–217. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 384].

This disease which was first noticed in 1929 in the Teschin district, has now spread over all parts of Austria where it causes great losses. The article is a detailed description of the disease.

[This condition was first called Teschin disease. In Germany it is now called *Ansteckende Schweinelähmung*, *Teschener Schweinelähmung*, or *Meningoencephalomyelitis*. In the *V. B.* it is proposed to call it porcine encephalomyelitis.]

SCHMIDINGER, F. A. (1940). Beitrag zur Schweinelähme. **[Contribution on Porcine Encephalomyelitis].**—*Wien. tierärztl. Mschr.* **27.** 136. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 385].

A record of the disease conveyed to a pig through the ingestion of purchased infected pig's flesh. The pig which ate this flesh was later slaughtered and its blood ingested by 20 piglets, all of which contracted encephalomyelitis and had to be killed. The danger of infected flesh is stressed and it is said that the disease is easily spread by the movement of persons on infected premises. [See note on paper by DIERNHOFER, above.]

I. —. (1940). **Report of the Special Committee on Rabies [American Veterinary Medical Association].**—*J. Amer. vet. med. Ass.* **97.** 415–416.

II. —. (1940). **Executive Board Recommendation Concerning Rabies [American Veterinary Medical Association].**—*Ibid.* 416–426.

I. The committee made the following recommendations for uniform adoption in the U.S.A. :–

(a) All dogs should be licensed, and all unlicensed dogs should be impounded and disposed of.

(b) Rabid and suspected rabid dogs should be properly disposed of, and definite diagnosis of the disease in these animals should be made.

(c) All dogs definitely known to have been bitten should preferably be destroyed. If not destroyed, they should be held in strict quarantine for six months. Dogs not definitely known to have been bitten but which have been in contact with rabid animals should be either (i) destroyed, (ii) placed in strict quarantine for a period of six months or, (iii) if given a course of rabies vaccine, quarantined for a period of not less than 60 days.

(d) Strict general quarantine measures should be enforced. Dogs should be confined to their individual premises within the quarantine area unless held on a leash or effectively muzzled.

(e) To these may be added the use of rabies vaccine.

It would be necessary to enact special federal and state legislation for rabies to be effectively controlled.

The rabies vaccines in current use are not as effective as could be desired but there is convincing evidence that they are capable of increasing the resistance of a considerable percentage of dogs.

It is not recommended that vaccination should be put on a compulsory basis.

II. The executive board entirely approved the above recommendations and put forward a policy based on four points :–

(a) That rabies is controllable by legislative measures, whilst compulsory vaccination cannot be relied upon.

(b) That there should be a national law giving a dog a status equal to that of other livestock.

(c) That a national government agency should be charged with appropriate legislation for a co-operative federal-state plan for the eradication of the disease.

(d) That there should be uniform compulsory laws capable of state and municipal enforcement designed for (i) destruction of stray dogs, (ii) licensing of dogs, (iii) education of the public about rabies, (iv) compulsory notification of suspected cases of rabies, and (v) a six-months' import quarantine for dogs.

At the meeting at which these recommendations were passed there was general discussion of the points raised.—J. E.

FLYNN, J. C. (1940). **The Control of Rabies.**—*J. Amer. vet. med. Ass.* **96.** 642–648. [Extract from author's summary copied *verbatim*].

We have herein presented and discussed : (1) The responsibility of the veterinarian for effective rabies control ; (2) a brief review of the fundamental characteristic of the disease ; (3) a program for controlling and ultimately eradicating rabies, consisting of (a) licensing all dogs, (b) eliminating strays, (c) vaccinating all dogs, and (d) applying necessary quarantine ; (4) the failure of " muzzle and shoot " rabies-control methods ; (5) numerous large-scale observations regarding the effectiveness of vaccination in various cities and in the laboratory ; (6) current unfounded criticisms of vaccination ; and (7) steps which are being taken to improve the effectivness of vaccination.

BOECKER, E. (1939). Tierversuche zur Frage der immunisatorischen Wirksamkeit von Wutschutzimpfstoffen aus formalinisierten Virus fixe. **[Animal Experiments on the Immunizing Power of Formolized Fixed Rabies Virus].**—*Z. Hyg. InfektKr.* **121.** 735–742.

Sixteen experiments were carried out on groups of rabbits which were injected with the Berlin strain of fixed rabies virus after it had been treated for 1–5 days with formalin (0·125–0·15 %). The injections were made on 13–15 consecutive days in daily doses of 0·5, 1, or 2 c.c. and the animals were subjected to a test injection with street virus given intramuscularly.

Seven out of eight controls succumbed to rabies, whilst only one of 25 test animals died of the disease.—J. E.

CHIARI, B. (1938). Il virus fisso dell-Istituto Siero Vaccinogeno Eritreo di Asmara (Ceppo Pasteur). **[The Fixed Rabies Virus (Pasteur Strain) of the Serum Vaccine Institute, Eritrea].**—*Boll. Ist. sieroter. Milano.* **17.** 47–59. [Translation of German summary].

In 1936 a series of controlled tests on the fixed rabies virus kept at Asmara was carried out. In comparison with the original properties of the virus which had been obtained from the Pasteur Institute the Asmara virus was found to have the same incubation period, but was only infective when injected subdurally or into the eye: it was quite inactive when injected intramuscularly or intraperitoneally. It was pathogenic in a dilution of 1 : 500,000. The fixed virus, injected subcutaneously, protected dogs against a highly virulent street virus.

The virus was very slightly resistant to 95% alcohol, whilst it resisted 120 hours' contact with sulphuric ether and it survived in 50% glycerin for 106 days.

When prepared as a phenol vaccine the virus was still active after 7 and after 18 days, but when kept at 37°C. the virus was inactivated in 24–36 hours. C. believes Asmara fixed virus is well suited to the preparation of an effective vaccine.—J. E.

FERREIRA, J. (1938). A raiva e a vacinação anti-rábica dos cães. **[Rabies and Anti-rabic Vaccination of Dogs]**.—*Rev. Med. vet., Lisboa.* **33.** 261–283.

F. discusses the antirabic vaccination of dogs as a preventive measure and gives statistics considered to prove the efficiency of this measure in the countries where it has been carried out consistently.

Various types of vaccines are discussed and also the size of the inoculations, but no new information is given in this respect.—M. W.

OGAWA, T. (1939). **Studies on Preparation of Rabies-Vaccine. III. Purification of Rabies-Vaccine by Iso-Electric Point Method.**—*Jap. J. vet. Sci.* **1.** 75–88. [In Japanese: abst. from English summary].

The fixed virus could be purified to a certain degree by the iso-electric point method, as used by BEHRENS and NIELSEN [*V. B.* **11.** 450] to purify vaccinia virus. The material thus purified, although it contains the active virus in a smaller quantity, still preserves its antigenic property tolerably well. If further studies are made, it may prove to be of practical value as a rabies vaccine.

GEIGER, W. (1940). Schutzimpfung bei Hundestaupe. **[Immunization against Dog Distemper]**. — *Dtsch. tierärztl. Wschr.* **48.** 317–318. [Abst. from abst. in *Zbl. Bakt. I. (Ref.).* **138.** 390].

In two series of experiments it was shown that serum B prepared by G. and used in conjunction with German virus was effective for immunization purposes, whilst a commercial serum A plus virus was useless.

Comparative tests with Burroughs Wellcome serum and dry virus, and with German (Eystrup) serum and virus, showed that they were of equal value.

PINKERTON, H. (1940). **Immunological and Histological Studies on Mink Distemper.** —*J. Amer. vet. med. Ass.* **96.** 347–355.

Epizootics of mink distemper have not infrequently occurred in the U.S.A. The disease is clinically similar to infection in the ferret with dog distemper virus. Mortality was heavy and amounted to 100% in young mink. The characteristic intranuclear and intracytoplasmic inclusion bodies of distemper were found in the tissues of affected mink and their demonstration formed an accurate and rapid means of diagnosis. Limited transmission experiments suggested that the virus strains studied were more closely related to canine distemper than to the ferret strain. Vaccination was carried out on more than 4,000 animals on nine ranches, with a vaccine prepared from lung tissue of affected mink after the method of LAIDLAW and DUNKIN. Results appeared favourable and there was evidence that vaccination of young mink in the early stages of the disease had some curative effect. The vaccine was partially effective in protecting ferrets against the same strain of mink virus. Mortality in vaccinated ferrets was reduced from 100 to 50%, the disease was milder, and the incubation period prolonged.

Bacteriological and histological studies showed that secondary bacterial invaders were not of importance in mink distemper.—H. E. H.

THORSHAUG, K. (1939). "Kattepest." Infektiøs Gastro-Enteritis hos katt. **[Infectious Feline Enteritis]**.—*Norsk VetTidsskr.* **51.** 397–415. [English and German summaries].

A clinical description of feline gastro-enteritis, an outbreak of which occurred at Oslo in 1935.

T. carried out transmission tests in healthy cats and confirmed that the causal agent is filtrable. White mice, g. pigs, rabbits, dogs, and foxes were found experimentally to be resistant to infection. A few cats which had

recovered were tested for immunity against reinfection and were found to be resistant against a lethal dose of virulent filtrate.—J. E.

DE BLIECK, L. (1939). Influenza van biggen. **[Piglet Influenza].**—*Tijdschr. Diergeneesk.* **66.** 940–944.

The author draws attention to the existence of piglet influenza in Holland, which may cause a mortality in affected herds of as much as 25%. It is usually the big farms which are affected. The disease can easily be suppressed by hygienic measures, which are outlined. Vaccination gives uncertain results.—L. T.

ROSENBUSCH, C. T. (1939). La influenza del cerdo y su relación con la influenza del hombre. **[The Connexion Between Swine Influenza and Human Influenza].**—*An. Soc. rur. argent.* **73.** 463–465.

This is a discussion of present knowledge of the subject.—MILLER WATSON.

THEILER, M., & GARD, S. (1940). **Encephalomyelitis of Mice. I. Characteristics and Pathogenesis of the Virus.**—*J. exp. Med.* **72.** 49–67. [Extracts from authors' summary copied *verbatim*].

GARD, S. (1940). **Encephalomyelitis of Mice. II. A Method for the Measurement of Virus Activity.**—*Ibid.* 69–77. [Author's summary copied *verbatim*].

THEILER, M., & GARD, S. (1940). **Encephalomyelitis of Mice. III. Epidemiology.**—*Ibid.* 79–90. [Authors' summary copied *verbatim*].

I. The two strains of virus named GD VII and FA, respectively, accidentally discovered during experiments with yellow fever, have been shown to be immunologically related to each other, as well as to the virus of mouse encephalomyelitis. Infection of the central nervous system can be produced with both strains by intracerebral, intranasal, or intraperitoneal inoculations. By the use of graded collodion membranes the particle size of the virus of mouse encephalomyelitis has been shown to be from 9 to 13 mμ. The stability of the virus at different hydrogen ion concentrations has been tested. It has been found that there are two optima of stability, one at about pH 8·0 and the other at pH 3·3. The virus is readily inactivated at 37°C. by 1 per cent hydrogen peroxide. With increasing age mice acquire a relative resistance to the virus. Immunity to a subsequent intracerebral inoculation can be produced by intraperitoneal, as well as intranasal, administrations of relatively large amounts of virus.

II. In a study of mouse encephalomyelitis the following observations were made :- (1) A definite relationship exists between the amount of virus inoculated intracerebrally and the length of the incubation period. (2) The reciprocal of the incubation period was found to be approximately proportionate to the logarithm of the amount of virus inoculated. The relationship can, therefore, be given a simple mathematical form. (3) This fact provides a basis for a new method for measurement of the activity of mouse encephalomyelitis virus.

III. (1) In the feces of approximately two-thirds of normal mice 6 weeks of age an agent in all respects similar to the virus of mouse encephalomyelitis can be recovered. (2) In isolated mice, fed on sterile food and water, excretion of virus has been shown to persist up to 53 days after isolation. (3) In normal mice known to be virus carriers virus has been demonstrated in the gastro-intestinal tract but not in the central nervous system, thoracic or abdominal viscera, or any organs of the head. (4) The source of the virus excreted in the feces has been shown to be located in all probability in the intestinal wall. (5) Evidence is presented that the virus can invade the animal organism, as virus has been demonstrated in the mesenteric lymph glands.

FRENKEL, H. S., & VAN WAVEREN, G. M. (1938). Het kweeken van vaccine-virus in explantaties van de foetale runderhuid. **[Cultivation of Vaccinia Virus on Foetal Bovine Skin].**—*Versl. werkzaam. Staatsveearts. Onderzoek.-Inst. 1936–37.* pp. 58–62.

The authors succeeded in cultivating vaccinia virus in bovine embryo skin-tissue culture for nine generations, after which stage the virus was infective at a dilution of 17×10^{-13}. The technique is fully described.—J. E.

PERAGALLO, I. (1939). Sull'impiego della digestione triptica per l'ottenimento di una sospensione dei corpuscoli elementari del virus vaccinico cultivato nell'allantoide. **[Use of Tryptic Digestion in Obtaining a Suspension of Elementary Bodies of Vaccinia Virus from Cultures on the Allantoic Membrane].**—*G. Batt. Immun.* **22.** 209–215. [English, French and German summaries].

It is pointed out that the separation of E.B. in a state of purity will enable research to be undertaken on their real nature, and may also assist in diagnosis by the agglutination test or other serological reactions, and in work on artificial immunization. A method is described of the isolation of E.B. of vaccinia virus by inoculating eggs which have been incubated for 14–16 days, and, after a further three days' incubation, by removing the infected area of the chorio-allantoic membrane. After removing the lipoids with ether, washing in Locke's solution, drying, and powdering the material, it is suspended in a buffered solution in which it is washed by fractional centrifugation, first at 1,000 r.p.m., the sediment being discarded, and then at 3,500 r.p.m. which deposits the E.B. and fragments of tissue. This sediment is suspended in buffered saline (pH 8·0), defatted trypsin added, and the mixture is again incubated for ½–1 hour, and then once more washed by centrifugation, the final product being a relatively pure suspension of E.B.

In order to test the activity of this product it was diluted to various strengths and inoculated into eggs, the results being judged by the number of foci of infection detected on the allantoic membrane. It is claimed that it was still active at a dilution of 10^{-6}, and was slightly more active than the suspension obtained before the trypsin digestion.

—U. F. Richardson.

Behrens, C. A., & Nielsen, F. A. (1935). **Purification of Suspensions of the Virus of Vaccinia (Iso-Electric Point Method).** —*J. infect. Dis.* **56.** 41–48.

A method is described for preparing purified emulsions of dermovirus and neurovirus of vaccinia. The virus is separated from the extraneous material by precipitating the tissue at its iso-electric point. Weak organic acids such as carbonic and citric acids were used to obtain the required pH which was found to be between 4·4 and 4·8 for neuro-emulsions and between 4·7 and 5·5 for dermo-emulsions. Water-clear suspensions of the virus having high titres were prepared, from which 74–85% of the protein had been removed. This purified suspension was found to be unstable, but the addition of 1% gelatin greatly increased the stability, and preparations thus preserved with gelatin showed no decrease in virulence over a period of approximately two years.—R. A.

Nelson, J. B. (1940). **The Behavior of Pox Viruses in the Respiratory Tract. III. The Survival of Variola and Vaccinia Viruses in the Lungs of Mice Previously Infected with Variola.**—*J. exp. Med.* **71.** 653–660. [Author's summary copied *verbatim*]. [For previous parts, see *V. B.* **10.** 26].

Recovery from the transient pulmonary reaction which accompanies the nasal instillation of variola virus in mice was followed by a measurable protection against the homologous virus and also against vaccinia.

Variola virus which regularly survived in the lung of normally susceptible mice through the 5th day was noticeably reduced in titer on the 3rd day in the lung of recovered animals, and usually eliminated by the 5th day.

Vaccinia virus produced a less severe systemic reaction in recovered mice and its titer in the lung was significantly reduced on the 5th day.

The residence of both viruses in the lung of recovered mice was attended by pathological changes, visible macroscopically.

Vervoort, H., & Ruys, A. Charlotte. (1939–40). **The Recognition of Psittacosis.**—*Antonie van Leeuwenhoek.* **6.** 11–21. [Abst. in *Bull. Hyg., Lond.* **15.** 304, copied *verbatim.* Signed: R. Lovell].

The virus of psittacosis is present in cage birds in Amsterdam. It is, however, of low virulence and only occasionally are there isolated cases or small outbreaks of psittacosis in man. A record is given of the isolation of the virus and the use made of the complement fixation test for the purposes of diagnosis.

Frisk, R. A. (1939). Ett fall av psittakospneumoni på en pneumoniavdelning. [**A Case of Psittacosis**].—*Nord. Med.* **2.** 1196–1197. [English summary]. [Abst. from abst. in *Bull. Hyg., Lond.* **14.** 562].

A case of psittacosis in a human being, apparently contracted from an infected parrot owner.

Vierhapper, F. (1938). Neuere Ergebnisse chemischer Virusforschung. [**Developments in the Chemistry of Viruses**].—*Oest. ChemZtg.* **41.** 118–123.

A review, from the chemical point of view, of the general position of virus research up to the date of publication. The nature of viruses, methods of preparation and relative dimensions of illustrative examples are discussed.

—H. H. Green.

PARASITES IN RELATION TO DISEASE [GENERAL]

—. (1939). **Report of the Committee on Parasitic Diseases.**—*Proc. 42nd ann. Meet. U.S. Live Stk sanit. Ass., 1938.* pp. 209–214.

The striking results of the chemotherapeutic method of controlling parasites in equines has tended to overemphasize its value, with the result that too little attention is given to prophylaxis, particularly the importance of sanitation and treatment of manure. This report shows the great difficulties of applying really efficient methods for the destruction of parasites on pastures and in buildings. In manure heaps urine is a sterilizing agent which has the advantage of increasing the fertilizing value of the manure and which entails only the cost of collection. Only the outer layers escape the destructive effect of the heat generated in a manure heap. In closely constructed wooden containers, having double walls and a tightly fitting lid, nearly all helminths die within two weeks, but in open pits or manure heaps the surface needs treatment with urine; a 1 : 8 aqueous solution of urea may be used (the latter will sterilize approximately 150 times its weight in faeces). Many other chemicals are used to sterilize manure, fluids being more efficient than dry chemicals. With pastures much may be done by a system of stock rotation (ruminants or swine following equines).

A survey of trichomoniasis of cattle in the U.S.A. has shown that the disease has been diagnosed in 27 states. Accurate information is, however, difficult to obtain. A presumptive diagnosis may be made on the basis of the herd history, but this must be confirmed by the finding of the parasite. Transmission appears to be by coitus only although there have been some cases reported in virgin heifers which had been in close contact with infected cows. There is no experimental evidence that contact infection can occur. Measures recommended are, in cases of early, complete, and uncomplicated abortion, isolation without remating for three months. In temporary sterility due to trichomoniasis, breeding should not be resumed until oestrus has been regular for three months. The introduction should be avoided of mature animals into the herd without investigation of the breeding record and the herd history. The breeding record of the bull used requires special investigation.—J. A. G.

—. (1940). **Report of Committee on Parasitology [Amer. Vet. Med. Ass.].**—*J. Amer. vet. med. Ass.* **97.** 507.

Recommendations for the reconstitution of the committee are given, and it is suggested that the committee should initiate a survey of the animal parasitisms occurring in North America. —J. E.

SCHMID, F. (1940). Klima und Boden in ihrer Wirkung auf die Häufigkeit parasitärer Erkrankungen. **[The Action of Climate and Soil on the Incidence of Parasitic Diseases].**—*Dtsch. tierärztl. Wschr.* **48.** 375–377.

S. calls attention to the growing appreciation of the influence on disease outbreaks of environmental factors of every kind. He points out that soil and climate are the limiting factors of the character and density of vegetation, and hence also of animal populations and relationships, themselves of paramount importance in the spread of disease.

Examples are given of parasitic diseases, in outbreaks of which the influence of external factors is more obvious and direct. Serious attacks by midges (? golubatz midge] on cattle and horses are dependent on the presence of swiftly running water where the larvae can develop, and on sharp rises in temperature, such as may occur in spring, when the imagines swarm to attack animals not previously immunized by the bites of individual midges. The position in the Leine basin, northern Germany, is further complicated by an economic factor. Before the end of the last century, injury by midges was unknown in this district, due possibly to the fact that the meadows were at that time grazed exclusively by sheep until May, cattle not being brought out to pasture during the time of most dangerous midge activity.

The influences of soil and climate are still clearer in the case of parasites which have an intermediate host in their life cycle. This is clearly shown by the liver flukes of ruminants. Serious outbreaks of the liver rot due to *Fasciola hepatica* may occur following a number of wet seasons which have allowed a great increase in numbers of the host snail, *Limnaea truncatula.* Such increases will not be uniform over a large territory, but will be most marked in low-lying or marshy districts, especially where the soil is a heavy impervious clay. Distribution of the parasite will often follow

that of a particular rock stratum, whilst areas of igneous rock will be practically free. Occurrence of *Dicrocoelium lanceolatum*, on the other hand, is conditioned by the distribution of soils rich in calcium, areas of limestone or chalk being mainly affected.

In the same way, piroplasmoses are limited to those areas where moisture and vegetation are favourable to the development of the vector ticks.

An interesting example is described of the direct influence of soil moisture on worm infestation. The building of a *Reichsautobahn* interfered seriously with the drainage of a meadow where a herd of cattle had been regularly pastured. In that year many cases occurred of severe illness and death from lungworms, although previously the cattle had been healthy. The increased moisture apparently effected a large increase in numbers of the parasites, so that a mild residual infestation became a pathogenic one.

Faulty husbandry can be an important source of disease, an instance of which is provided by two herds of sheep maintained on the same pasture, one herd prospering while the other sustained considerable losses from worm infestation. The thrifty herd was tended only by an old and experienced shepherd, whereas the second herd was tended partly by the owner and partly by a shepherd.

Climate is shown to have had a considerable effect on the recent outbreak of tularaemia in Europe, since flooding of the steppes and other plains allowed widened distribution of infected water rats. Human cases were limited by an occupational factor, being mainly confined to persons who handled furs.—E. S.

SWELLENGREBEL, N. H. (1940). **The Efficient Parasite.**—*Rep. Proc. 3rd int. Congr. Microbiol. 1939.* pp. 119–127. New York: International Association of Microbiologists. [In English].

The paper opens with an explanation of the meaning of "efficient parasite". S.'s view, which is similar to that of THEOBALD SMITH, is that as it is to the parasite's disadvantage to destroy its host, the host's destruction is therefore an indication of the invading organism's inefficiency as a parasite. He is of the opinion that "predaceous organism" is a better term for such a parasite and that the term "efficient parasite" renders superfluous the terms "symbiont" and "commensal". [These are useful terms descriptive of special ways of living and should be retained.] Pathogenicity is the index of an organism's inefficiency: there are bacteria in which the success of the life-cycle depends upon the destruction of the host or prey, but these are "predaceous organisms", and "bacteria have done a good deal in the way of blurring our conception of what a parasite is really like". *Entamoeba coli*, for example, is an efficient parasite. From his experience in Dutch Guiana, S. discusses the tolerance of the bush negro population to *Plasmodium falciparum*, *P. vivax*, and *P. malariae*. Splenic reactions in the children, and to a lesser extent in adults, indicated an imperfect efficiency on the part of the parasite, but the number of parasites per carrier showed a diminished reproduction rate in the adult host which means that in the case of both host and parasite there was some sacrifice made because of parasitism, and yet little likelihood of the annihilation of either man or plasmodia. To quote S.'s words "I maintain the parasite's claim to the title of 'efficient' since it allows itself to be domesticated in this way", (*i.e.*, by reducing its numbers to fit in with the tolerance of the host).

—C. HORTON SMITH.

JOHNSON, E. P. (1939). **A Method of Raising Turkeys in Confinement to Prevent Parasitic Diseases.**—*Bull. Va agric. Exp. Sta.* No. 323. pp. 16.

J. illustrates and gives specifications of a turkey house protected from flies by cheesecloth and devised to prevent parasitic diseases, but especially to control a *Leucocytozoon*-like blood parasite, causing up to 50% losses during the summer months, and transmitted by *Simulium nigroparvum*, which is prevalent in Virginia. The houses were tested over a three-year period, turkey poults being raised in them from the age of six weeks to maturity, while control birds were kept on open ground which had not held poultry for several years.

Supplementary foods were found essential to prevent perosis in the confined birds, green alfalfa alone being inadequate; 1 lb. of manganese per ton of mash, a reduction of bone meal (or meat scraps) and calcium together with an increase of cod liver oil, controlled the disease. Fighting, especially among the males, was largely stopped by clipping about ⅛ in. from the upper beak; this served also to check any feather pecking. The difference in mortality between housed and unhoused turkeys was less than might occur on land heavily infested with parasites. Adult "carrier"

birds were disposed of as soon as the breeding season finished, the chief source of infection being thus eliminated. Some of the control birds were slightly affected with the blood parasites each year. Blackhead, coccidiosis, gapeworms, round worms and tapeworms were equally controlled in the special houses. Tables give data on feeding, labour costs, weight gains, and mortality for both groups of birds. Temperature and humidity inside the houses must be considered, an exposed rather than a sheltered site being shown to be preferable.—C. V. W.

ASTLE, N. L. (1940). **Starlings Injure Cattle.** —*Vet. Med.* **35.** 235–236.

The " English starling " [presumably *Sturnus vulgaris*] was intentionally introduced into New York about 1890, and has adapted itself so successfully that it has now spread from the eastern states to the Middle West and the Great Plains area. In 1937, starlings in Kansas were found to be taking warble fly larvae (*Hypoderma lineatum*) from the backs of cattle. During the following two years there were no further reports, but during the cold winter of 1939–40 persistent attacks were observed on cattle with warbles or with any form of wound abrasion. One typical case is cited, in which about 100 yearling beef cattle were attacked about a week after they had been branded. So severe and persistent were the attacks that deep, infected wounds were caused and the animals frequently stampeded. Although the wounds eventually healed, the brand marks were obliterated. As far as A. is aware, livestock other than cattle have not been attacked. With the end of the cold weather the attacks ceased.

—ALASTAIR N. WORDEN.

PARASITES IN RELATION TO DISEASE [ARTHROPODS]

KELSER, R. A. (1940). **Methods of Exposing Experimental Animals to Virus Infection Through Mosquito Vectors.**—*Amer. J. publ. Hlth.* **30.** 866–870.

K. describes the methods employed in handling experimental mosquitoes and exposing animals to their bites during his work in connexion with the transmission of equine encephalomyelitis. It is advisable to shave the hair, using only warm water without soap, from the area of the skin to be exposed. In horses the area is usually at the side of the neck, in laboratory animals the belly wall. Species of mosquitoes differ in their reaction to light, temperature, etc. Some feed at once, others may die without feeding. Most species will not take a good blood meal more often than every third or fourth day. Usually feeding is accomplished within 30 min. Between blood feeding, the mosquitoes are fed on 10% sugar solution with a little ripe banana.—H. V. HUGHES.

MACLEOD, J. (1940). **The Moisture Balance of the Living Fleece in Relation to Blowfly Myiasis, with some Remarks on the Australian and British Conceptions of Susceptibility.**—*Ann. appl. Biol.* **27.** 379–392.

The relative humidity of the basal fleece air was estimated gravimetrically with paper hygrometers. Under dry summer conditions, the values obtained rarely exceeded 50% saturation; during rain the R. H. may rise above the normal but seldom reaches saturation. Penetration by rain is greater in close-wooled than in open-wooled sheep; water droplets may reach the inner fleece, but they will quickly evaporate.

In summer, the basal fleece contains more moisture than can be accounted for by the R. H. of the adjacent air; this is ascribed to rapid secretion of moisture-containing yolk. Equilibrium is re-established in the middle of the fleece. Normally, the R. H. of the basal micro-climate is too low for the survival of blowfly eggs or newly hatched larvae. Except during rain, the moisture content of the basal fleece is a reliable index of the suitability of an area for the establishment of myiasis.

The second part of the paper is an attempt to resolve the divergent views of Australian and British workers on the causes of strike. It is suggested that apparent discrepancies are largely due to different conceptions of the term " strike ", which in British papers means only the development of myiotic lesions, but in Australian includes also oviposition or " blow ".

—R. P. HOBSON.

DEONIER, C. C. (1939). **Responses of the Blowflies, *Cochliomyia americana* C. & P. and *Phormia regina* Meigen, to Stimulations of the Tarsal Chemoreceptors.**— —*Ann. ent. Soc. Amer.* **32.** 526–532. [Abst. from author's summary].

C. americana was found to have on the tarsi and proboscis gustatory chemoreceptors through which non-volatile substances, such as

sucrose and salts, can be detected. Mercuric chloride, in concentrations of 0·5–2·0%, was found to be more repellent in 0·5*M* than in 1*M* sucrose to starved specimens of *C. americana* mounted on bees-wax cubes. Similar specimens of *P. regina* were repelled less at 48 hours of age than at 24 hours, the older flies showing only a slightly reduced feeding response to 0·25% of the poison in sucrose. There was no significant difference in response between the sexes.

The responses of free flies were found to be comparable. The tarsal chemoreceptors were used to select solutions to feed on. The flies died of starvation when 2% mercuric chloride in sucrose solution was the only source of food and water offered. The death rate was higher and starvation more rapid in tests conducted during the summer.

MESNARD, J., & TOUMANOFF, C. (1939). Au sujet du rôle joué par *Stomoxys calcitrans* dans la transmission de *Trypanosoma annamense*, Laveran. **[The Role of *S. calcitrans* in the Transmission of *T. annamense*].**—*Rev. méd. franç. Extr.-Orient.* **17.** 995–999. [Abst. in *Rev. appl. Ent.* **28.** 126, copied *verbatim*].

After briefly reviewing the literature on the transmission of surra by *Stomoxys calcitrans*, L., the authors state that they have carried out experiments in which reared examples of this fly were fed for 5–6 days on a guineapig infected with *Trypanosoma annamense* (the causal organism of surra in Indo-China, where it is fairly common among domestic buffalos and oxen) and then daily for 12–30 days on a healthy guineapig. Details of several of the experiments are given. The guineapigs all remained healthy during the period for which they were kept under observation (about 3 months). Thus, if the trypanosome undergoes development in the fly, it must take longer than was supposed, or the incubation period of surra in guineapigs infected under these conditions is particularly long. An account is also given of an experiment in which the infection was transmitted mechanically from an infected to a healthy guineapig by the interrupted feeding of a single fly. Further experiments will show whether this is the usual mode of transmission, but even if it is exceptional experimentally, it may still be of importance in nature in view of the abundance of the fly in the vicinity of cattle.

GHIDINI, G. M. (1939). Nuovi dati sulla distribuzione delle glossine nelle terre dell'Impero. **[New Data on the Distribution of *Glossina* in Abyssinia].**—*Riv. Biol. colon.* **2.** 329–333. [English, French, and German summaries]. [English summary amended].

The presence is recorded of *G. tachinoides*, *G. palpalis* var. *fuscipes*, and *G. pallidipes* in the district of Gambela, Abyssinia, on the borders of the Sudan.

PARASITES IN RELATION TO DISEASE [HELMINTHS]

JACOB, E. (1939). Parasiten beim Iltis aus freier Wildbahn. **[Parasites in Wild Polecats].**—*Dtsch. tierärztl. Wschr.* **47.** 475–477.

Thirty polecats were examined. In 87% of them the lungworm *Pseudostrongylus putorius* was found, but the parasites were so thoroughly interwoven with one another that it was impossible to extricate one in its entire state. Other nematodes found were :–*Capillaria putorii* and *Capillaria entomelas* in 83% of the animals, *Molineus europaeus* in 24%, a filariid which could not be identified, and two ascarids (ascarids have not been recorded hitherto from polecats).

Trematodes observed were *Euparyphium melis* in 76% of the animals, several hundred specimens being recovered from one intestine, and encapsulated larval trematodes, *Distomum putorii* in 55%, and *Diplostomum putorii*, once only.

The only cestode seen was *Taenia pisiformis* which was recovered from three of the polecats.
—A. L. WILSON.

EDWARDS, W. P. S., & SINTON, W. L. (1940). **Equine Nasal Granulomata Due to Schistosoma Nasalis.**—*J. R. Army vet. Cps.* **12.** 36–37.

A clinical account of a case in a filly with a nasal discharge. Glanders was suspected, but a mallein test yielded negative reactions. At autopsy the lungs and nasal septum were found to contain numerous granulomata with round-cell and eosinophilic infiltration due to a schistosome which, from the general characters, appeared to be *S. nasalis*.—M. L. BINGHAM.

ANNEREAUX, R. F. (1940). **A Note on**

Echinoparyphium Recurvatum (von Linstow) Parasitic in California Turkeys. —*J. Amer. vet. med. Ass.* **96.** 62–64.

From the upper portion of the intestinal tract of a ten-week-old turkey, 267 flukes were recovered. The parasites and lesions produced by them are described; the size of the former was greater than usual. Two six-week-old turkeys from the same lot were uninfested. In two types of snails, recovered from a creek which supplied the turkeys with water, neither cercariae nor metacercariae could be found. Mallard ducks or a related bird may have been the original source of this infestation.—A. L. W.

I. DA FONSECA, F. (1939). Novo trematoide parasita de galinha, Brachylaemus fleuryi sp. n. (Brachylaemidae, Fascioloidea). Nota prévia. [*B. fleuryi* **n. sp., from the Domestic Fowl**].—*Bol. biol., S. Paulo.* **4.** 114–116. [English summary.]

II. PEREIRA, C., & CUOCOLO, R. (1939). A propósito de "Postharmostomum commutatum (Diesing 1858)". [*Brachylaemus commutatus*, **a Trematode of the Domestic Fowl**].—*Arq. Inst. biol., S. Paulo.* **10.** 73–86. [English summary].

I. The author describes a species of *Brachylaemus* from the caecum of the domestic fowl, in São Paulo, Brazil.

II. The authors describe a trematode found in the caeca of domestic fowls in São Paulo, and identify it as *Brachylaemus commutatus*. The trematode is identical with *B. fleuryi* described by DA FONSECA in 1939 [see I] and the authors conclude that he was wrong in his classification. A description of the parasite is given, with illustrations, a list of synonyms, and a comparison with allied species.—M. WATSON.

CASE, A. A., & ACKERT, J. E. (1939). **Intermediate Hosts of Chicken Tapeworms found in Kansas.**—*Trans. Kans. Acad. Sci.* **42.** 437–442. [Abst. in *Exp. Sta. Rec.* **83.** 255, slightly amended].

Of ten species of fowl tapeworms reported from the U.S.A., six have been found in chickens in Kansas, namely, *Raillietina cesticillus*, *R. tetragona*, *R. echinobothrida*, *Hymenolepis carioca*, *Choanotaenia infundibulum*, and *Amoebotaenia sphenoides*. Three species of beetles are recorded as intermediate hosts of *C. infundibulum*, namely, *Amara fallax*, *Anaferonia constricta*, and *Tenebrioides mauritanicus*.

WILLIAMS, S. R. (1939). **Variation in** *Moniezia expansa* **Rudolphi.**—*Ohio J. Sci.* **39.** 37–42.

A fragment of *M. expansa* is described and figured, in which the sex organs of three proglottides are irregularly divided into two abnormal proglottides, one with a double set of organs on the left side, the other with some extra structures on the right. There is a discussion on the possible mechanism by which such abnormalities could arise.—E. S.

KRULL, W. H. (1940). **Investigations on Possible Intermediate Hosts, other than Oribatid Mites, for** *Moniezia expansa*.—*Proc. helminth. Soc. Wash.* **7.** 68–71.

An area 120 ft. long by 30 ft. broad was fenced off and a tapeworm-free lamb, four months old, was grazed on it. Five weeks later 39 immature *M. expansa* were recovered from it at P.M. examination. Ants, beetles, centipedes and millipedes, crickets and grasshoppers, cockroaches, earthworms, lepidopterous larvae, mites, pillbugs, slugs, springtails, and spiders, collected from the pasture on which the lamb had grazed, were fed to tapeworm-free lambs; in addition, one lamb was given 906 oribatid mites representing species other than *Galumna emarginata*, a known vector of *M. expansa*. None of the lambs fed with these invertebrates was infested with tapeworms on P.M. examination.

The optimal conditions for survival of the larvae in the eggs were a moist environment and temperatures from 36°–38°F. Under these conditions eggs remained viable for 325 days. They survived alternate freezing at 17°–24°F. and thawing for 103 days, but the percentage of viable eggs was reduced by this process. Other eggs allowed to dry at room temperature until the shape was distorted and then transferred to water seldom survived more than 21 days, while a few eggs kept in water and not exposed to drying lived for 60 days.

It is stated that ants transport tapeworm eggs from one place to another and may thus carry them to places where their possibilities of survival are greater. K. observed ants dragging gravid segments over many feet of pasture, during which process many eggs adhered to blades of grass. Furthermore, ants were observed to drag the segments into the ground. Centipedes and earthworms also carry the eggs into the ground, thus making them available to the intermediate hosts over a longer period.

—A. L. WILSON.

LUTTERMOSER, G. W. (1940). **The Effect on the Growth-Rate of Young Chickens of Infections of the Tapeworm** *Hymeno-*

lepis carioca.—Proc. helminth. Soc. Wash. **7.** 74–76.

In two experiments, 20 worm-free Rhode Island Red chicks, two and four weeks old, were divided into pairs according to weight and sex. One bird of each pair was given about 1,000 cysticercoids of *H. carioca* while the other was used as a control; all 20 birds were kept under worm-free conditions and fed a well-balanced diet for six weeks. At P.M. examination an average of 533 tapeworms was recovered from each infected bird of the younger group, while an average of 917 worms was recovered from the infected birds of the older group. Examination of the results obtained showed that this cestode had little or no effect on the growth rate and that it was not pathogenic under the conditions of the experiment.—A. L. W.

SENEKJI, H. A., & BEATTIE, C. P. (1940). **The Incidence of Hydatid Disease in Iraq.** —*Trans. R. Soc. trop. Med. Hyg.* **33.** 461–462.

Examination of 123 street dogs in Baghdad showed that 17·8% were infested with *Echinococcus granulosus*. Corresponding figures for cattle and for sheep and goats were 24·66 and 11·93% respectively. The incidence in man is about 1 : 300.—D. D. OGILVIE.

HASHIMOTO, S. (1939). **A Patho-Histological Research on the Pituitary Bodies Especially the Anterior Lobes of Dogs Infected with** *Dirofilaria immitis*. **(Report I).**—*Trans. Soc. path. Japon.* **29.** 534–537. [Abst. in *Helminth. Abstrs.* **8.** 99, copied *verbatim*].

Hashimoto, examining the pituitary glands of 8 dogs infected with *Dirofilaria immitis*, reports a greater concentration of microfilariae in the anterior lobe. In some cases this lobe showed oedema, an increase of connective tissue, eosinophilic infiltration, and reduced basophiles. No marked changes occurred in the middle and posterior lobes.

HILL, C. H. (1940). **The Prevalence of Larvae of** *Trichinella spiralis* **in the Hearts, Livers, Stomachs, and Kidneys of Experimentally Infected Swine.**—*Proc. helminth. Soc. Wash.* **7.** 83–84.

Swine of various ages were experimentally infected with 20,000–100,000 larvae each, 25–35 days prior to slaughter. Portions, left after removal of other tissues, of 52 hearts, 38 livers, and 38 stomachs, and portions of the kidneys from 19 swine were examined for larvae. Five hearts contained 1–13 larvae, five stomachs 7–41 larvae, and seven livers 1–6 larvae, but none of the kidneys was infested. All the larvae recovered were active, appeared normal, and were in the infective stage, though their infectivity was not experimentally tested. In view of these findings a plea is made for the thorough cooking of the hearts, stomachs, and livers of swine used for food.—A. L. WILSON.

VAN SOMEREN, V. D. (1939). **The Bone Marrow in Trichinosis of the Rat.**—*J. Helminth.* **17.** 13–20.

Eight adult white rats were infected with 500–600 encysted larvae. Five of the rats were killed 13, 14, 21, 30, and 45 days after infection, and three were killed 60 days after infection. In the acute stage of the condition the only alteration observed macroscopically was increased pinkness of the marrow. Microscopically, a functional myeloid hyperplasia was evident, this occurring to the greatest degree in the peripheral zones and ends of the marrow in the femur. The medullary portion of the marrow was not markedly affected. After recovery and encystment of the larvae, two distinct marrow pictures were observed. In one of the rats killed 60 days after infection the blood count had returned to normal although a low grade eosinophilia was still present. Two other rats killed after the same period showed an abnormally high neutrophile count although the eosinophiles were normal. A description of the normal marrow is also given.—A. L. WILSON.

IMMUNITY

TODA, T., & MURATA, M. (1939). Studien über die aktiven Komponenten des Tuberkulins. [**The Active Principles of Tuberculin**].—*Beitr. Klin. Tuberk.* **93.** 64–78. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **135.** 267].

Some of the active principles of tuberculin pass through a semi-permeable membrane. The dialysable and non-dialysable components behave differently. The former are always lethal for tuberculous g. pigs, whilst the latter have a slight toxic action but a marked cutaneous action. Three fractions were differentiated by the kaolin adsorption method, *viz*, a nucleo-

protein (NPS), a polypeptide (PPS), and a polysaccharide (PSS), all coming from the protein-free part of tuberculin. The N content of NPS was 11·3%, of PPS 8·8%, and of PSS 0·4%. All three fractions can be used for skin tests on tuberculous g. pigs, although PPS has a higher toxic action than the others. Formalin and trypsin remove from PPS its cutaneous and toxic actions, but do not affect NPS and PSS. None of the fractions provokes hypersensitivity or antibody production. PSS can act strongly as a precipitinogen. PSS immunizes against TB. to a certain extent, without causing any tuberculin allergy.

HECKE, F. (1940). Zur serologischen Bang-Diagnose. (Die Agglutination, Komplementbindung und Meinicke-Reaktion, ihre Zuverlässigkeit und richtige Bewertung.) **[Serological Diagnosis of Brucella Infection]**.—*Dtsch. tierärztl. Wschr.* **48.** 255–258. [Abst. from abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 369].

The results of 1,000 comparative tests of agglutination, complement - fixation and Meinicke's reactions for bovine brucellosis are given. The two last agreed within 3%; Meinicke's reaction is preferred because it is simpler to carry out. The error between the Meinicke and aggln. tests, at a titre of 1 : 25 as the criterion, was only 4 or 5%, and that of the c.-f. and aggln. tests was about 6 or 7%. If an aggln. titre of 1 : 100 is taken as critical, Meinicke's test reveals 11% more positive reactors and the c.-f. test 12% more.

In practical testing it is recommended that Meinicke's test be used first and the aggln. test used also only in doubtful cases, a titre of 1 : 25 being taken as indicating infection. This procedure will require much less time than the use of the aggln. test alone.

MEZNIK, K. (1939). Untersuchungen über die Agglutinationsmethode Stableforth-Willems zur Diagnose der Banginfektion des Rindes. **[Trials with the Stableforth Agglutination Test for Bovine Brucellosis]**.—*Wien. tierärztl. Mschr.* **26.** 556–557.

M. gives an account of the technique adopted by STABLEFORTH [*V. B.* **7.** 184.] for conducting the agglutination test (essentially the use of a thick suspension standardized by means of a standard dried serum), and of the modification introduced by WILLEMS whereby this standard suspension is given a factor (0·08) obtained by dividing the lowest positive titre (1 : 40) by the titre given with the standard dried serum (1 : 480). This factor can then be made use of in determining the positive range of any other suspension whose end titre with the standard serum is known, *e.g.* if this titre is 1 : 1,000 the lowest positive titre can be taken as 0·08 × 1,000 = 1 : 80, and so on. M. recommends the adoption of a uniform technique in accordance with that recommended by these workers.
—S. J. EDWARDS.

TERRACHINI, F. (1939). Su di un metodo di agglutinazione rapida per la diagnosi della brucellosi. **[A Rapid Agglutination Method for the Diagnosis of Brucellosis]**. —*G. Batt. Immun.* **22.** 732–738. [English, French and German summaries].

In order to test the value of centrifugation as a method of saving time in getting aggln. results, three series of tests were carried out in which a suspension of *Br. abortus* was exposed to sera of known qualities. In one series the results were judged after incubating the tubes for 6–7 hours, and then standing at room temperature for 10–12 hours; in another series tubes were centrifuged for 10 min. at 3,500 r.p.m., and in the third series tubes were incubated for half-an-hour and then centrifuged.

Negative sera gave negative results by all three methods, and high titre agglutinating sera gave positive results, but low titre agglutinating sera which gave positive results by the slow method sometimes gave doubtful or even negative readings when tested by the centrifuge methods.—U. F. RICHARDSON.

PRITCHETT, H. D., & WALTON, S. T. (1940). **A Study of the Agglutination Titres of Milk Serum from Known Infectious Abortion Reactor Cows.**—*J. Amer. vet. med. Ass.* **96.** 709–714.

These experiments were undertaken to determine to what extent *Br. abortus* antibodies occurred in the milk of cows whose blood gave positive reactions to the aggln. test. Milk was obtained from 500 cows selected from 200–300 herds, and tested at various periods of lactation. A comparison of tube and plate methods of testing milk showed a variation of 1·17%. Of the 500 cows, 63·4% showed a positive reaction in a dilution of 1 : 50, and 44% in a dilution of 1 : 100.—S. J. GILBERT.

TASMAN, A., & BRANDWIJK, A. C. (1939).

Effect of Electrolytes on the Flocculation Reaction of Ramon.—*J. infect. Dis.* **65.** 73–77.

The effect of monovalent and divalent cations and monovalent, divalent, and trivalent anions on the optimum ratio between toxin and antitoxin giving maximum flocculation and on the time of flocculation, was studied by adding sodium chloride, sodium sulphate, magnesium chloride, and potassium ferrocyanide in concentrations of 0–2,500 milli-equivalents per litre to equal volumes of solutions containing the same amount of diphtheria toxin, dialysed free from salt, and by flocculating these solutions against one dilution of diphtheria antitoxin at 50°C. The salts used were found to have no effect either in high or low concentrations on the optimum ratio of toxin and antitoxin, but to have a very definite effect on the time of flocculation, each salt having an optimum concentration giving most rapid flocculation.—R. O. Muir.

Platt, A. E. (1941). **The Role of Sodium Chloride in the Agglutination of Bacteria by Antibody.**—*Abst. Diss. Univ. Camb. 1939–40.* pp. 35–36. [Copied *verbatim*].

In an investigation of the effect of sodium chloride upon the agglutination of *Brucella abortus* by homologous antiserum and of *Bacterium typhosum* by *Bacterium stanley* antiserum, it was found that the salt concentration required for optimal flocculation depended in part on the serum/suspension ratio, but mainly upon the concentration of antiserum. In the presence of this optimal salt concentration the suspension-serum mixtures flocculated more rapidly than at any other salt concentration, and with it the highest end-point titres of the antisera were obtained. Evidence was obtained in support of the view that maximum antibody fixation was obtained at the salt concentration optimal for agglutination.

It was also found that salt might considerably affect the *antibody* and antigen serum/suspension ratios. With a suspension prepared from a recently isolated strain of *Br. abortus* the optimal serum/suspension ratios were unaffected by change in salt concentration. With a suspension prepared from the same strain of *Br. abortus* twelve months later, and with the *Bact. typhosum* system, variation in the optimal serum/suspension ratios occurred with change in salt concentration. Constancy of the optimal ratios could only be obtained in the presence of optimal concentrations of salt.

In an attempt to elucidate the nature of these phenomena the ζ potential of both organisms was determined by electrophoresis in a modified Northrop and Cullen apparatus. In the absence of salt increasing concentrations of the corresponding antiserum produced a progressive decline in ζ potential of both organisms. A similar result was obtained for *Bact. typhosum* in the presence of salt. With *Br. abortus* and the homologous antiserum the ζ potential reached a minimum at the *antibody* optimum serum/suspension ratio; with further increase in antiserum the potential increased.

It seems likely that the principal effect of salt is to reduce to some critical level the forces which tend to prevent (i) antibody molecules from approaching the surface of the cell, and (ii) the sensitized organisms from colliding or cohering.

Chambers, L. A. (1939). **Orientation of Antigen-Antibody Specificity in Monomolecular Films.**—*J. Immunol.* **36.** 543–557. [Author's summary copied *verbatim*].

A technic for studying the orientation of reaction-specificity in monofilms of complex proteins has been developed. It consists in estimating the degree of antigen-antibody reaction at the two faces of deposited monofilms by comparison of specific bacterial adsorption in the two cases.

Application of the procedure has, in the case of a specific streptococcal agglutinogen (nucleoprotein), demonstrated that the deposited monofilms are not only immunologically active, but that there is a definite orientation of specificity toward antisera correlated with structural orientation.

Goebel, W. F. (1939). **Studies on Antibacterial Immunity induced by Artificial Antigens. I. Immunity to Experimental Pneumococcal Infection with an Antigen containing Cellobiuronic Acid.**—*J. exp. Med.* **69.** 353–364. [Author's summary copied *verbatim*].

1. An artificial antigen containing the azobenzyl glycoside of cellobiuronic acid gives rise in rabbits to antibodies which: (a) give the Neufield reaction and agglutinate Type III pneumococci, (b) confer passive protection on mice against infection with Types II, III, and VIII pneumococci.

2. Rabbits immunized with the artificial

cellobiuronic acid antigen acquire active resistance to infection with virulent Type III pneumococci.

3. The antibodies evoked by an antigen containing the azobenzyl glycoside of cellobiose exhibit none of these phenomena.

NERI, F., & MICELI, A. (1939). Intossicazioni e difese immunitarie. Nota II. —Ulteriori ricerche sulla influenza del saturnismo sperimentale sulla immunitá anticarbonchiosa. **[Intoxication and Protective Immunization. II. Recent Research on the Influence of Experimental Lead Poisoning on Immunity to Anthrax].**—*G. Batt. Immun.* **23.** 380–385. [English, French and German summaries]. [Abst. from English summary].

Rabbits with lead poisoning reacted to vaccination against *Bacillus anthracis* infection in the same way as normal rabbits.

PETERS, B. A., & TODD, H. (1940). **Some Unbroken Assumptions in Epidemiology.**—*Publ. Hlth, Lond.* **53.** 215–220.

The widely accepted view that the transference of immune bodies from the maternal to the foetal circulation depends on the number of cell layers in the placenta is questioned. In the human subject, with the fewest placental layers, it has been shown that the foetal blood, compared with the maternal, contains very small amounts of globulin. It is known that very young infants are immune to diphtheria and scarlet fever even in cases where they could not possibly have acquired this immunity from their mothers. On the other hand, infants are susceptible to measles and whooping cough although the parenteral administration of maternal serum will usually protect them.

On the basis of epidemiological evidence the current opinion that a Schick-negative reaction is always due to an active immunity resulting from a clinical or subclinical infection is also questioned. It has been shown that when simple fats are finely emulsified they can neutralize considerable amounts of diphtheria toxin, and it is suggested that free proteolytic enzymes for foreign proteins may play some part in destroying toxins in the body.

P. believes that immunity to infection may be partly due to nonspecific detoxicating agents which vary in amount with age.—J. FRANCIS.

WEBSTER, L. T. (1939). **Inborn Resistance to Infectious Disease.**—*Sci. Mon., Lond.* **48.** 69–72.

W. disproves the theory that epidemics are controlled by the fluctuating virulence and numbers of the causative organism. He refers to work carried out over a number of years on inherent resistance of the individual. Pure-bred mice of known resistance were used in the experiments. It was found that the severity of an epidemic depended entirely upon the proportion of resistant to susceptible mice in the group used, the susceptibles only, with few exceptions, becoming affected. No specific acquired immunity was noted in the few surviving susceptibles.

BAUMGARTNER, Leona. (1934 & 1937). **Age and Antibody Production. II. Further Observations on Qualitative Changes in Antisera Associated with Age. III. Quantitative Studies on the Precipitin-Reaction with Antisera Produced in Young and Adult Rabbits.**—*J. Immunol.* **27.** 417–427, and **33.** 477–488. [For Part I, see *V. B.* **5.** 144].

II. In a previous publication B. demonstrated that the antibody elaborated by an adult animal had a greater avidity than that produced by a young or an aged animal. These further investigations have shown that the qualitative differences in these sera are associated with the age of the serum-producing animal and are independent of the titre of the serum. Although the avidity of a serum tends to increase with increased titre, a serum of high titre sometimes shows a relatively low avidity. The temperature at which the observations are made does not appear to affect the reaction.

[The first paragraph in the author's summary contains the statement that antisera produced by young animals have greater avidity than those from adult or aged animals—an obvious oversight.]

III. In these investigations the precipitin test was used to study the differences in the reactions of sera from animals at different ages. By using the method of optimal proportions, certain neutralization tests, and by studying the reaction between crystalline ovalbumin and specific precipitating sera, it was apparent that there was a marked difference in the behaviour of precipitating sera produced in young and adult rabbits. The amount of precipitin formed by young rabbits seemed to be markedly less than that formed by adult rabbits.

—GWILYM O. DAVIES.

CHURCH, C. F., & FOSTER, Claire. (1940). **Diet and Resistance to Infection. III. Genetic Versus Dietary Factors.**—*Amer. J. publ. Hlth.* **30.** 1217–1220.

A continuation of the authors' earlier studies upon the susceptibility to *Salmonella enteritidis* of mice of different genetic constitution and on varying maternal and "ancestral" diets [see *V.B.* **10.** 37.] has amply confirmed the different degrees of resistance possessed by genetically different individuals. On the other hand, the importance of the maternal diet, which was stressed in earlier publications, is now considered to be an open question, since prolonged changes in maternal or grandmaternal diets did not appear to exercise any influence upon the individual resistance of the offspring. Further experiments are being undertaken, in which crossed matings will replace the sibling matings (*i.e.* matings between offspring of the same parents but of different litters) hitherto employed.—A. N. W.

ECKER, E. E., & PILLEMER, L. (1940). **Vitamin C Requirement of the Guinea Pig.**—*Proc. Soc. exp. Biol., N.Y.* **44.** 262–263.

Results of 870 blood serum ascorbic acid values showed that the maximal concentration in the serum of the g. pig occurred only when a daily dose of 10–20 mg. was given. It has been shown that serum complement reaches its maximal activity at a level of about 1 mg. of ascorbic acid per 100 c.c. and, in order to maintain this level and hence the normal activity of the blood serum proteins, an intake of about 10 mg. per day is necessary.—R. A.

I. COPE, O., & KAPNICK, I. (1940). **The Relation of Endocrine Function to Resistance and Immunity. I. The Changes in Complement and Response to Vaccinia Following Alterations in Thyroid, Adrenal and Pituitary Function in the Rabbit and Dog.**—*Endocrinology.* **27.** 533–542.

II. KAPNICK, I., & COPE, O. (1940). **The Relation of Endocrine Function to Resistance and Immunity. II. The Independence of Cevitamic Acid and Complement Following Alterations in Thyroid Function in the Rabbit.**—*Ibid.* 543–547.

I. Complement concentration and the response to vaccinia virus were measured in 35 rabbits and three dogs after either thyroidectomy, hypophysectomy, or adrenalectomy; 181 rabbits were used as controls. All the animals were maintained on adequate diets. The results indicate a direct relationship between thyroid function and complement concentration. There was a significant decrease in complement concentration in the blood serum of thyroidectomized and hypophysectomized rabbits. It is pointed out that the decrease in the latter case could be due either to a primary loss of the anterior pituitary hormone or to a decrease in thyroid activity secondary to loss of the anterior pituitary. In the unoperated animals, injection of thyroxin caused an increase in the complement titre. No consistent change in complement concentration occurred after adrenalectomy either in the rabbit or the dog.

The response to vaccinia virus in rabbits was not affected by thyroidectomy or injection of thyroxin, but after adrenalectomy and hypophysectomy there was a delayed and a diminished response respectively. In spite of the observed consistent changes in complement concentration and response to the vaccinia virus following alterations in endocrine function, no direct hormonal relationship can as yet be deduced.

II. The vitamin C content of the serum was estimated in rabbits after thyroidectomy and injection of thyroxin. It was found that even though the complement concentration fell [see I] the ascorbic acid level remained within normal limits after thyroidectomy, while after thyroxin injection the rise in complement concentration was accompanied by an almost complete disappearance of vitamin C from the blood. This relation between the complement concentration and the vitamin C content of the blood in rabbits is in complete contrast to that observed in g. pigs by ECKER and his collaborators [see preceding abst.]. It is suggested that these two animals may possess an inherent difference in the metabolism of complement as well as ascorbic acid and it is concluded that the changes in complement concentration accompanying changes in thyroid activity in the rabbit are independent of the vitamin C level of the blood.—R. ALLCROFT.

COMAN, D. R. (1940). **Chemotaxis of Monocytes Contrasted with that of Polymorphonuclear Leukocytes and Lymphocytes.**—*Arch. Path.* **30.** 896–901. [Author's summary copied *verbatim*].

The chemotactic reactions of rat monocytes

have been compared with those of polymorphonuclear leukocytes and lymphocytes. The responses of these cells to *Staph. aureus*, the tubercle bacillus and an aluminium silicate have been studied in tissue culture. It was found that whereas polymorphonuclears show positive chemotaxis to both *Staph. aureus* and the tubercle bacillus, monocytes and lymphocytes under similar conditions fail to exhibit chemotaxis. Toward aluminium silicate polymorphonuclears exhibit strong negative chemotaxis, while monocytes are weakly repelled and lymphocytes show no reaction.

It is concluded that the monocyte, lymphocyte, and polymorphonuclear differ in their behavior, at least in the rat. Possible explanations for the appearance of monocytes in inflammatory foci have been mentioned and the course of further investigation suggested.

MONACO, B. (1939). Sul potere battericida del sangue " in toto " di cavia, e sulle sue modificazioni dopo brevi ascensioni in alta quota. [**Bactericidal Power of G. Pig Blood**].—*G. Batt. Immun.* **23.** 641–653. [English, French and German summaries]. [Abst. from English summary].

G. pig whole blood had, in most cases, a bactericidal effect on strains of *Bacterium coli* and staphylococci, but not on *Salmonella typhi*, *Bacillus anthracis*, and streptococci. The bactericidal power varied in different g. pigs, and decreased considerably when the animals were removed to places high above sea level. It is claimed that the bactericidal power of the blood is our index to resistance to infection.

The method used for determining the bactericidal power is described.

BASKAKOW, S. A. (1939). **Non-Specific Agglutination in the Blood of Horses.**—*Arb. Kirowschen zootech. vet. Inst.* **4.** 13–18. [In Russian]. [Translation of abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 380].

Auto-haemoagglutination was observed with the blood of 16% (this is higher than normal) of horses affected with suppurative diseases. Auto-aggln. does not, however, serve as an indicator of suppuration in the body. Pseudo-haemoaggln. occurred in 55% of the horses examined.

The addition of pus extract and growth products of *Staphylococcus flavus* to the blood of healthy horses had no effect on its agglutinating properties, merely interfering with differentiation.

DRAGSTEDT, C. A., RAMIREZ DE ARELLANO, M., & YOUMANS, G. P. (1940). **Passive Sensitization of Rabbit's Blood.**—*J. Immunol.* **39.** 537–542. [Authors' conclusions copied *verbatim*].

1. The addition of antiserum and corresponding antigen to normal rabbit's blood leads to the release of histamine from cells to plasma comparable to that occurring when antigen alone is added to the blood of an actively sensitized rabbit.

2. The addition of antiserum and corresponding antigen to normal rabbit's blood which is perfusing the lungs of a normal rabbit induces an obstruction to the flow of blood through the pulmonary vessels, a leukopenia and decreased histamine-content of the perfusate.

3. Both of the above-mentioned reactions occur promptly, and occur whether the antigen is added before or after or simultaneously with the antiserum.

4. It is believed that this experimental demonstration of an anaphylactic reaction with blood after passive " sensitization " provides the explanation for the reported occurrence of passive anaphylaxis in rabbits without the necessity of a latent period.

HITE, K. E. (1939). **The Bacteriology and Immunology of Chronic Staphylococcal Osteomyelitis. II. The Effect of the Inflammatory Tissue on Antigens and Antibodies.**—*J. infect. Dis.* **64.** 93–96. [Author's summary copied *verbatim*].

Staphylococcus toxin, botulinum antitoxin and horse plasma were found not to be destroyed by in vitro incubation for 16–20 hours with pus and emulsions of chronic inflammatory sinus tracts.

In vivo experiments demonstrated that sufficient horse plasma remained in sinus tracts for 24 and 48 hours to be detectable by the anaphylactic reaction.

MACFARLANE, R. G., OAKLEY, C. L., & ANDERSON, C. G. (1941). **Haemolysis and the Production of Opalescence in Serum and Lecitho-Vitellin by the α Toxin of *Clostridium welchii*.**—*J. Path. Bact.* **52.** 99–103.

Evidence is presented to show that the opalescence which is produced in human serum by *Cl. welchii* toxins is caused by an active principle contained in α toxin. The effect of the toxin on a known lipo-protein, lecitho-vitellin, and on human serum and red blood

cells (sheep) showed that the opalescence was due to the aggregation of finely divided free fat probably released by the toxin for combination with protein ; lipoid material was also set free by the α toxin from the lecitho-vitellin solutions. It was found that any process which reduced the haemolytic activity of the toxin reduced its capacity to produce opalescence in serum and lecitho-vitellin. This strict parallelism between the two reactions of the toxin suggested that both these activities might be manifestations of the same enzyme reaction, and it was demonstrated that haemolysis by α toxin and its reaction with serum and with lecitho-vitellin occur only in the presence of ionized calcium.—R. ALLCROFT.

ZUGER, B., HOLLANDER, A., & FRIEDEMANN, U. (1939). **Potentiation of Tetanus Toxin by Tissues and Chemicals.**—*J. infect. Dis.* **65.** 86–91. [Authors' summary copied *verbatim*].

Tetanus toxin is markedly potentiated by guinea pig muscle, liver and kidney or saline extract of these tissues. The potentiating factor is present in the muscle of the highly resistant rabbit and chicken as well as in that of the highly susceptible guinea pig. The potentiating effect is the same whether the muscle toxin is injected immediately after its preparation or after incubation at 37°C. for 3 hours. The potentiating effect is not due to an increase of toxin. Potentiated and unpotentiated toxins are neutralized by the same amounts of antitoxin. The potentiating factor in muscle is heat stable, alcohol soluble and acetone insoluble. Potentiation was observed with acetates, citrates, glycocholates and Wassermann antigens. No potentiation was observed with lactates, malates, oleates, lecithin, choline and acetylcholine. Some samples of toxin, apparently, are already fully potentiated by the constituents of the toxin broth.

SMITH, M. L., & SORDELLI, A. (1939). **Enquiry on the Assay of Gas-Gangrene Antitoxin (perfringens). I. Comparative Titrations of Gas-Gangrene Antitoxins (perfringens).**—*Bull. Hlth Org. L.o.N.* **8.** 797–824. [Authors' summary copied *verbatim*].

IPSEN, J. (1939). **Enquiry on the Assay of Gas-Gangrene Antitoxin (perfringens). II. Comparison of Test Toxins from Various Institutes.** — *Ibid.* 825–832. [Author's summary copied *verbatim*].

IPSEN, J., & DAVOLI, R. (1939). **Enquiry on the Assay of Gas-Gangrene Antitoxin (perfringens). III. The Antigenic Constitution of perfringens Toxins Produced with Various Strains and Media.**—*Ibid.* 833–848.

IPSEN, J. (1939). **Enquiry on the Assay of Gas-Gangrene Antitoxin (perfringens). IV. The Preparation of Test Toxins Suitable for the Assay of Gas-Gangrene Antitoxins (perfringens).**—*Ibid.* 849–855. [Author's conclusions copied *verbatim*].

I. (1) Three institutes have titrated three different perfringens antitoxins against the international perfringens standard antitoxin by means of the three different toxins.

(2) The comparison was performed intravenously in mice, intracutaneously in guinea-pigs and *in vitro* against sheep erythrocytes.

(3) The minimum haemolytic, lethal and necrotic doses varied considerably in the different laboratories, while the equivalent doses of toxin and antitoxin agreed with a standard deviation of 10%.

(4) In the serum assays, performed intracutaneously in guinea-pigs and intravenously in mice with the three toxins, the potency readings agreed with a standard deviation of 10%.

(5) The haemolytic test showed that one of the three toxins had an antigen different from that of the other two. For the two toxins with the lowest haemolysin content the haemolytic test gave the same serum titres as the *in vivo* test. For the most highly haemolytic toxin, the divergent titres produced indicated the presence in the toxin of a haemolysin (α-lysin), different in antigenicity from the lethal and necrotic factor (ζ toxin).

(6) The existence of two different antigens in perfringens toxin has thus been confirmed, but the literature gives evidence that lethal factors other than that present in the three toxins in question (ζ toxin) seem to exist.

II. (1) Three perfringens toxins originating from Beckenham, Frankfort and Copenhagen yielded the same titres for four antiperfringens sera tested intravenously in mice and intracutaneously in guinea-pigs. (2) A toxin prepared by Professor WEINBERG yielded widely divergent titres for these sera when tested by the intravenous mouse method. (3) In haemolytic assays of the sera, the titres fell into two groups, the one corresponding to those of the test mentioned under (1), the second differing

from both the latter and from those of the intravenous mouse test with Weinberg's toxin. (4) Anti-perfringens sera will show the same relative potency when ζ toxins are used as test toxins in the intravenous mouse test. Further investigation of the nature of the toxins produced by Professor WEINBERG is necessary.

III. *Clostridium perfringens* antitoxins show the same activity when assayed against different toxins if the toxins contain one and the same predominant antigen.

The haemolysin content influences the assay on animals when the ratio $\frac{\text{m.l.d.}}{\text{m.h.d.}}$ exceeds 100.

Intravenous assays on mice give results corresponding to those obtained intracutaneously in g. pigs when pure ζ or $\zeta\alpha$ toxins are used.

There is a relation between the activity of a *Cl. perfringens* antitoxin determined *in vitro* (haemolysis) and *in vivo* if pure ζ toxins are used in both tests.

IV. For the assay of perfringens antitoxins by the mouse intravenous method and by the haemolytic method, toxins with only one predominant factor must be used. The existing International Standard for perfringens antitoxin contains antibodies against the three hitherto described partial toxins, and can be used as a standard for each of them. Most of the existing national standards are established with reference to the ζ antibody and have very probably a relative content of α and η antibodies different from that of the International Standard.

A perfringens toxin (P.1) suitable for estimating the ζ antibody content in perfringens antitoxins is prepared in Copenhagen, and will be placed at the disposal of institutes wishing to compare its qualities with their existing test toxins or with toxins to be analysed before use.

BENGSTON, Ida A., & IPSEN, J. (1939). **A Proposed International Standard for Gas-Gangrene Antitoxin (Sordelli).**—*Bull. Hlth Org. L.o.N.* **8.** 856–861.

Results obtained at the institutes in Buenos Aires, Copenhagen, Marburg, and Washington by the intravenous titration in mice of gas gangrene toxins from Buenos Aires, Copenhagen, and Washington with antitoxins from Paris, Marburg, and Washington showed that Sordelli antitoxin could be evaluated with suitable accuracy, the result being independent of the toxins used. It was therefore recommended, in order to secure a larger measure of equivalence in the designation of the potency of gas gangrene antitoxins, that the international unit for gas gangrene antitoxin (Sordelli) should be defined as two provisional units of the dry, stable Washington preparation.
—R. O. MUIR.

STEWART, Sarah E., & BENGTSON, Ida A. (1939). **Studies on the Standardization of Gas Gangrene Antitoxin** (*Sordellii*).—*Publ. Hlth Rep., Wash.* **54.** 1435–1441.

Details are given of the preparation of the United States *Clostridium sordellii* toxin and of the determination of the test dose in mice against a glycerinated Argentine Republic antitoxin. The results of standardization of the United States standard antitoxin and of four commercial antitoxins against the test dose of *Cl. sordellii* toxin suggested that the unit proposed by SORDELLI might be accepted as the provisional unit pending its international acceptance. Deterioration tests demonstrated that dry *Cl. sordellii* toxin was relatively stable at a low temperature in the absence of oxygen, but unstable at high temperatures and when exposed to oxygen.—R. O. MUIR.

DISEASES, GENERAL

LAJA, F. (1940). Lühike ülevaade tähtsamate loomataudide torjest viimase 20 aasta jooksul Eestis. [**Control of Important Animal Diseases in Estonia during the Last 20 Years**].—*Eesti loomaarstl. Ring.* **16.** 81–90. [Abst. from German summary].

Before the war of 1914–18 the area which later became Estonia was free from rinderpest, bovine contagious pleuro-pneumonia, glanders and swine fever. During the war bovine contagious pleuro-pneumonia, foot and mouth disease, glanders, and mange [host not named] were introduced. By energetic measures the first two of these diseases were eradicated and were absent up to 1939. Equine mange occurred among 60,000 horses when the Republic in 1918 was founded and was finally eradicated in 1936. Bovine tuberculosis appears, from abattoir statistics, to have diminished in recent years; in 1925 7·3% of slaughtered cattle were tuberculous and in the

last few years less than 4%. There is a State voluntary control scheme on the lines of Bang's method. Bovine brucellosis has been successfully brought under control by a voluntary scheme in which infected cows are sold for slaughter and compensation is paid. Rabies was formerly widespread, but has recently been eradicated except at the southern border. Anthrax still occurs to the extent of about 60 cases annually. Pullorum disease has been eradicated.

SCHWANGART, F. (1940). Ueber die endemische Parese des Rotwildes und Tuberkulose beim Reh. I & II. **[Endemic Paresis in Red Deer and Tuberculosis in Roe Deer. I & II].**—*Berl. Münch. tierärztl. Wschr.* Feb. 9th. 61–66 and Feb. 16th. 75–77.

S. discusses various theories on the causation of paresis of red deer, including diplococcosis of the spinal canal, *Gastrophilus* myiasis, and arsenical poisoning. Paresis produced by trypanosomiasis, as seen in certain countries, is also discussed. Two cases are described from widely separated herds and showing typical symptoms, in which filariae were found in great numbers in the subdural space of the lumbar cord, where local inflammatory changes were noted. The parasites were 2·5–5 cm. long and were almost mature. Their possible mode of entry is surmised. They have not been identified, but S. discusses the possibilities of their proving to be *Onchocerca flexuosa*, *Setaria labiato-papillosa*, or *S. equina*. A vivid clinical description of the disease is given.

German literature concerning TB. of big game is discussed. Although comparatively common in red and fallow deer and in boars, it is rare in roe deer, but when they do become infected generalization follows. Two cases of pulmonary TB. are described; the bacilli were thought to be of the human type, but infection was apparently from cattle.—G. WILLIAMSON.

I. SMITH, W. K. (1939). **The Alleged Protective Action of Alfalfa against the Hemorrhagic Sweetclover Disease.**—*J. agric. Res.* **59.** 211–215.

II. CAMPBELL, H. A., ROBERTS, W. L., SMITH, W. K., & LINK, K. P. (1940). **Studies on the Hemorrhagic Sweet Clover Disease. I. The Preparation of Hemorrhagic Concentrates.**—*J. biol. Chem.* **136.** 47–55.

III. FAIRBANKS, B. W., & CURZON, Elizabeth. (1940). **Animal Nutrition. Vitamin K and Sweet Clover Disease.**—*N. Amer. Vet.* **21.** 657–659.

IV. STEVENSON, T. M., & WHITE, W. J. (1940). **Investigations Concerning the Coumarin Content of Sweet Clover. I. The Breeding of a Low-Coumarin Line of Sweet Clover**–*Melilotus alba.*—*Sci. Agric.* **21.** 18–28.

V. WHITE, W. J., & HORNER, W. W. (1940). **Investigations Concerning the Coumarin Content of Sweet Clover. II. Sources of Variation in Tests for Coumarin Content.**—*Ibid.* 29–35.

I. In experiments on rabbits a marked variation in the response of animals of similar age to sweet clover disease was observed during the assay of toxicity of various spoiled sweet clover hays. Susceptible animals continued to give similar reactions throughout a series of experiments although with increasing age they became increasingly less susceptible, while resistant animals maintained their resistance throughout.

Results did not support QUICK's conclusion [*V. B.* **8.** 471.] that alfalfa contains an accessory factor which protects animals against sweet clover disease. A 10% supplement of commercial alfalfa hay, a 12·9% supplement of freshly cut alfalfa, or a 10% supplement of kiln-dried alfalfa, added to a known toxic hay failed to give any protection against the disease. Because of these negative results it is suggested that it would be unsafe to attempt the control of sweet clover disease in livestock by the inclusion of a small quantity of alfalfa hay in a diet of sweet clover hay.

II. An extraction and fractionation scheme is described by which the haemorrhagic substance in spoiled sweet clover hay may be quantitatively separated and concentrated. 0·6 g. of this concentrate fed to standardized susceptible rabbits reduced the plasma prothrombin to 10% of the normal in 40–48 hours. This represents a 200-fold concentration (minimum) of the haemorrhagic principle. The chemical nature of the principle is still unknown, but it is stated that the concentrate is essentially free from the following classes of substances: fats, waxes, certain pigments, sugars, glycosides, water-soluble polysaccharides, water-soluble acids, amines, alkaloids, water-soluble proteins, and water-soluble decomposition products of chlorophyll.

III. A brief discussion on vitamin K including properties, distribution, symptoms

resulting from deficiency of, and the requirements of various animals for, the vitamin. The possible relationship between vitamin K and sweet clover disease is discussed and it is pointed out that the vitamin appears to be of no benefit in treating the disease which is thought to be caused by a compound formed from coumarin, the bitter principle of *Melilotus alba*, during spoilage of the hay. No original work is reported.

By continuous selection in inbred lines a strain of sweet clover was developed, the foliage of which contained only about one-tenth the amount of coumarin found in ordinary sweet clover. Coumarin is the alkaloid which is largely responsible for the stinging bitter taste of ordinary sweet clover and it is stated that it has been shown that coumarin is indirectly responsible for the so-called sweet clover disease of cattle.

V. As several irregularities were apparent in the results of coumarin analyses reported in IV, further investigations were carried out on the variation in coumarin content of sweet clover plants. The results showed that the amount of coumarin varied in different parts of the plant and in the stage of growth of the plant. Also considerable variation was traced to the test itself so that a more refined method of estimation is certainly desirable before further work is undertaken on the production of a coumarin-free variety.—R. ALLCROFT.

THUNBERG, E., & CARLSTRÖM, B. (1940). Om nyssjuka hos svin från epizootisynpunkt. **[Epizoology of Chronic Rhinitis in Swine]**.—*Skand. VetTidskr.* **30.** 711–723. [English summary].

The authors report their experiences of this disease among pigs on a farm owned by one of them. It was determined that the cause of the disease, which could affect sows as well as their progeny, was associated with particular premises. When healthy sows were kept on certain premises, they and their litters contracted the disease after the due interval required for the development of the disease. When piglets of a litter were separated into two groups and one group was kept on " affected " premises and the other on new premises, only the former group contracted the disease.

There was no evidence of hereditary transmission.—J. E.

KEELER, C. E. (1940). **The Inheritance of Predisposition to Renal Calculi in the Dalmatian.**—*J. Amer. vet. med. Ass.* **96.** 507–510.

Unlike all other animals lower than the apes and man, the Dalmatian excretes in its urine, not allantoin, but uric acid as the chief end-product of purine metabolism. This is not due to absence of uricase, the enzyme responsible for oxidation of uric acid to allantoin.

High uric acid excretion of Dalmatians has been found by breeding experiments to be inherited as an almost completely recessive, non-sex-linked Mendelian character. It has no hereditary relationship to the polka-dot marking of the Dalmatian's coat.

Corresponding to the high uric acid excretion, K. finds a high incidence of renal calculi in the breed, and inclines to the view that a diathesis to nephrolithiasis is inherited.—J. W. W.

ENGEL, S., & NEWNS, G. H. (1941). **Bronchitis and the Bronchial Tree.**—*Lancet.* **240.** 212–214.

The anatomical structure of the bronchial tree was studied in children, and the distinction between bronchi and bronchioles and the peculiarities of the mucous membrane and its glands are discussed. The bronchi, irrespective of size, are characterized by a strong wall consisting of fibrous and elastic tissue reinforced by cartilage ; the wall is provided with glands which decrease in number as the bronchial tree branches. The trachea and main bronchi have abundant glands which moisten the lung and cleanse the air entering the lung. The bronchi are extrapulmonary. The bronchioles, which are thin walled, devoid of cartilage and glands, and in direct contact with lung tissue, are the intralobular continuation of the bronchi. Because of their position and abundant glands the trachea and bronchi are common sites for catarrh. So-called bronchitis is generally tracheo-bronchitis and is one of the chief manifestations of common colds and influenza. Bronchitis of the smaller bronchi is less common. Broncheolitis, characterized by inflammation of the whole bronchiole wall, is an intrapulmonary process and therefore serious, in contradistinction to extrapulmonary bronchitis.—R. ALLCROFT.

FARBER, S. (1940). **Neuropathic Pulmonary Edema. Further Observations.**—*Arch. Path.* **30.** 180–197. [Author's summary copied *verbatim*].

Acute pulmonary edema is produced in recently vagotomized rabbits within a few minutes after intravenous infusion of physiologic solution of sodium chloride in amounts

and at rates which cause only moderate pulmonary congestion in intact rabbits and in atropinized rabbits with intact vagus nerves. When intact or atropinized rabbits in which moderate pulmonary congestion has been produced by rapid intravenous infusion of saline solution are subjected to bilateral cervical vagotomy followed by infusion of small additional amounts of the solution, acute pulmonary edema is produced without delay. Rapid intravenous infusion of saline solution into rabbits subjected to unilateral vagotomy causes either moderate congestion or congestion and slight edema. Tracheotomy has no demonstrable effect on these results. The action of atropine sulfate does not duplicate the consequences of bilateral cervical vagotomy in respect to the production of acute pulmonary edema. The plasma volume, red blood cell volume, blood volume and hematocrit reading become considerably reduced during the development of acute pulmonary edema caused by bilateral cervical vagotomy. The erythrocyte level may be above or below normal, depending on whether pulmonary hemorrhage occurs as a complication of the severe edema and congestion. The various factors concerned in the genesis of the acute pulmonary edema produced under the experimental conditions employed in these studies are considered and their relative importance discussed.

HASS, G., & SCHULZ, R. Z. (1940). **Amyloid. I. Methods of Isolating Amyloid from other Tissue Elements.**—*Arch. Path.* **30.** 240–259. [Authors' summary copied *verbatim*].

Amyloid-bearing tissues obtained post mortem from patients with chronic pulmonary tuberculosis were cut into thin sections with a freezing microtome. Three types of amyloid were encountered. All were insoluble in buffer solutions ranging from pH 1 to 10. The three varieties, whether present in the liver, spleen or kidney, were soluble at 5 to 10°C. in phosphate buffer solution at pH 11. Almost all normal liver protein soluble in the range pH 7 to 11 was soluble in the range pH 7 to 10. By successive extractions of thin sections of fresh amyloid-bearing liver at pH 7, pH 10 and finally pH 11 it was possible to obtain hepatic amyloid protein in a reasonably pure form. Two fractions of protein were obtained. The principal fraction amounted to 85 to 90 per cent of the total protein extracted at pH 11. It remained in solution on neutralization of the solvent. At 15 to 17 per cent saturation with ammonium sulfate, on addition of acetic acid or on dialysis against distilled water it began to precipitate, and at half saturation with ammonium sulfate was completely precipitated. The second protein fraction remained in solution on neutralization of the alkaline buffer solvent. It was precipitated along with the principal fraction by half saturation of the solvent with ammonium sulfate but was soluble in dilute acetic acid and distilled water.

LEONARD, M. E., & FALCONER, E. H. (1941). **Experimental Thrombocytopenic Purpura in the Guinea Pig.**—*J. Lab. clin. Med.* **26.** 648–657. [Authors' summary copied *verbatim*].

An antiplatelet serum has been produced that is capable of selectively destroying blood platelets and causing purpura. The production of purpura is apparently related to the quantitative reduction in the number of circulating platelets and to the rapidity of the fall in the platelet level.

The effect of the serum on animals with anatomically intact capillaries and on animals with capillary lesions (vitamin C deficiency) is the same. This suggests that the capillary factor is functional rather than anatomic and could be more profitably studied by physiological means. The hypothesis is advanced that capillary dilatation in addition to a platelet deficiency is necessary before hemorrhage can occur.

Vitamin C does not protect guinea pigs against experimentally produced thrombocytopenic purpura.

PADDOCK, F. K. (1940). **The Diagnostic Significance of Serous Fluids in Disease.**—*New Engl. J. Med.* **223.** 1010–1015.

Data on over 1,300 fluids were collected and classified in order to ascertain what diagnostic aid could be obtained from the characteristics of pathologic serous body fluids as demonstrated by easily performed tests, such as specific gravity, cellular constituents, and protein content.

The customary division of transudates from exudates at the sp.gr. of 1·016 was found to be true only in certain diseases. The results of an attempt at differentiation on this basis are discussed. The protein content of effusions contributes no more to the diagnosis than does the sp.gr. The total white cell count was above 1,000 per c.mm. three times as frequently

in infected as in noninfected fluids from both the pleural and peritoneal cavities. Neoplastic fluids had a white cell count above 1,000 in 50% of the cases. It is concluded that the differential white cell count is of little diagnostic value except in differentiating non-tuberculous infections.—R. ALLCROFT.

MENKIN, V. (1940). **Mechanism of Leukocytosis with Inflammation. The Nature of the Leukocytosis-Promoting Factor in Exudates.**—*Arch. Path.* **30.** 363–373. [Author's summary copied *verbatim*].

There exists in inflammatory exudates a factor capable of inducing marked increase in the number of circulating leukocytes. The presence of this leukocytosis-promoting factor is readily demonstrated by noting the effect of injected exudate on the leukocyte level of a normal animal. Earlier studies have shown that various other, unrelated materials, including blood serum, broth, turpentine, bacteria, nucleic acid derivatives, histamine and leukotaxine, are wholly ineffective in reproducing in dogs precisely the same pattern of response as exudates produce. The leukocytosis-promoting factor bears no evident relationship to leukotaxine, the nitrogenous substance responsible for the increase in capillary permeability and leukocytic migration.

The leukocytosis-promoting factor is thermolabile and essentially nondiffusible. Observations on protein fractionation of exudates either after dialysis or after "salting out" of the material at various concentrations of ammonium sulfate indicate either that the leukocytosis-promoting factor is a globulin or that at least it is closely associated with that protein fraction. The available data warrant the belief that the factor seems linked primarily with the pseudoglobulin fraction of inflammatory exudate.

Studies are in progress in an effort to purify further this active globulin-like substance which *per se* offers an explanation for the mechanism of leukocytosis accompanying inflammation.

—. (1940). **Poultry Laying Trials, 1939–40. List of Deaths During the Trials.**—*Harper Adams Util. Poult. J.* **25.** 322–324.

This is an unclassified list of the causes of death in each bird.

TAUT, K. (1939). Jahresbericht über die deutschen Legeprüfungen für Hühner 1937/38. **[Yearly Report on Laying Trials in Germany, 1937-1938].**—*Arch. Geflügelk.* **13.** 89–111. [English summary].

This record concerns about 1,200 hens in laying trials and 500 hens in flock trials. The usual productivity results are given and also mortality records. 233 hens (13·4%) died, one-quarter of them from virus diseases, including fowl pox and leucosis. Fowl paralysis is tabulated under diseases of the nervous system and accounted for 5·6% of the deaths. Diseases of the uro-genital system were the cause of death in 23%, helminthiases in 12%, and diseases of the digestive tract in 9%, while only 5% were of bacterial origin. For further details the original should be consulted.—J. E.

JOHNSTON, J. W., & WILSON, J. E. (1939). **Observations on the Etiology and Control of Fowl Paralysis.**—*Vet. J.* **95.** 474–485. [Authors' summary copied *verbatim*].

1. These experiments are concerned with the influence of environmental factors on the incidence of fowl paralysis.

2. When newly hatched chicks were taken from the original plant, where the disease was prevalent, and reared on fields where poultry had not previously been kept, the mortality was very much lower than in the case of closely related birds reared in the original plant.

3. The disease appeared in birds hatched from eggs obtained from a stock free from disease but reared in the original plant.

4. Isolation, though proved by the appearance of coccidia to be incomplete, was effective in reducing the incidence of the disease and postponing the onset of symptoms.

5. The results obtained suggest that the disease is infectious and can be controlled by methods of management specially designed for that end.

MARQUET, R. (1939). Recherches sur l'étiologie de la paralysie des volailles. **[Aetiology of Fowl Paralysis].**—*Thesis, Alfort.* pp. 82.

M. advances the theory, without supplying satisfactory proof, that fowl paralysis is due to an over-rich diet, which engenders the presence of an intestinal "toxin"; that this agent is absorbed into the bloodstream and there acts detrimentally on the haemocytoblasts with the result that a lymphocytosis is brought about. —J. E.

OLSON, C., Jr. (1940). **Transmissible Fowl Leukosis. A Review of the Literature.** —*Bull. Mass. agric. Exp. Sta.* No. 370. pp. 48.

A comprehensive review.

CLAUDE, A., & ROTHEN, A. (1940). **Properties of the Causative Agent of a Chicken Tumor. XIV. Relation between a Tumor Nucleoprotein and the Active Principle.**—*J. exp. Med.* **71.** 619–633. [For part XIII, see *V. B.* **8.** 290].

The tumour-producing fraction isolated from chicken tumour 1 by differential centrifugation was found to possess a characteristic absorption spectrum in the ultra-violet region. It was shown that the absorption was due to nucleic acid or a closely related compound ; liberation of nucleic acid by various methods of inactivation depressed the absorbing power. It is suggested that the nucleo-protein may be an essential part of the causal agent.—E. G. W.

INNES, J. R. M., & WHITTICK, J. W. (1940). **Multiple Malignant and Benign Neoplasms in a Dog with Secondary Tumour Obstruction of the Portal Vein without Ascites.**—*J. comp. Path.* **53.** 115–118. [Authors' summary copied *verbatim*].

Two malignant tumours are described in a dog. One was a polymorphic or mixed-cell sarcoma arising from either the periosteum of the lumbo-sacral vertebrae or the retroperitoneal connective tissue with metastases to the liver and contiguity spread to the lesser omentum. Occlusion of the portal vein by the tumour was not accompanied by ascites, which is a valuable corollary to the experimental observation that back pressure from the portal vein is not solely responsible for the development of ascites. The other, a tumour of the eyelid, was a malignant form of *adenoma sebaceum* arising from the Meibomian glands with metastatic deposits in the cervical lymph nodes.

NUTRITION IN RELATION TO DISEASE

HOLMBOE, F. V. (1939). En oversikt over en del grunnstoffers betydning for sykdom på husdyr. [**Review of Animal Diseases Associated with Green Forage**].—*Norsk VetTidsskr.* **51.** 491–500.

A short review of livestock diseases in various parts of the world caused by either deficiency or excess of the following elements in pasture herbage :– copper, cobalt, manganese, zinc, iodine, boron, fluorine, selenium, molybdenum, potassium, magnesium, and sodium.—J. E.

FRENCH, M. H. (1939). **A Survey of the European-Owned Cattle in the Northern Province.**—*Rep. Dep. vet. Sci. Tanganyika, 1938.* Pt. I. pp. 97–108.

A survey was made of groups of farms in the Northern Province of the Territory where dairying conditions prevail (a) to obtain information on the extent to which mineral supplements for the dairy stock would be required, (b) to investigate reported cases of aphosphorosis and " lamsiekte ", and (c) to obtain statistical information of the dry season anaemia which develops in this area. A selection of cattle of all ages was made from each group and blood samples were examined for inorganic P and Hb content. Details of the farming conditions and blood analyses are given for each of the areas visited. In most areas there appeared to be little likelihood of serious P deficiencies. A few doubtful areas were found and for these phosphatic licks were recommended. There was no evidence to substantiate the reports of aphosphorosis and " lamsiekte ". By far the greater proportion of stock showed some degree of anaemia especially in the dry season ; the extent and significance of this is discussed. Various reasons were suggested as to the cause of the anaemia, but there is very little concrete evidence for any one specific reason ; it is suggested that it is associated with a lowered nutritional state caused by the dry seasons.—ALFRED EDEN.

FRENCH, M. H. (1939). **Studies on the Effects of Food and Water Shortages on Cattle.** —*Rep. Dep. vet. Sci. Tanganyika, 1938.* Pt. II. pp. 80–96.

Digestibility coefficients of the crude constituents of hay of moderate feeding value in two oxen were the same when the animals were fed at sub-maintenance and at maintenance levels. When the hay was fed *ad lib.*, one ox with a normal appetite had again the same capacity for digestibility, but the other animal with excessive consumption showed a definitely lower level of digestibility. Mineral and N metabolisms were affected by the reduction in rate of storage owing to diminished intake, and the rate of excretion was augmented by liberation of minerals from the autolysed soft tissues

in a period of loss of body weight. Even at the lowest levels of intake, bone formation was still possible owing to positive Ca and P balances.

There were no significant differences in digestibility coefficients when oxen were given water every second or third day compared with water allowed *ad lib.* Similarly watering every second or third day still permitted minerals and N to be stored in the body, although these elements were possibly less efficiently absorbed or retained. With growing and lactating animals interference with the water metabolism resulted in lowered productivity if not in actual unthrifty appearance. When grazing became scarce, three-day intervals between waterings tended to cause cattle to lose weight at a greater rate than when they were watered every day or every other day. The provision of more adequate facilities is strongly advocated.

Determinations were made of the water consumption of animals under varying conditions of watering. Grade Ayrshire cattle had a much heavier water consumption than the native zebu cattle, and this was more marked in yearlings than in older animals. The food consumption of grade cattle was also higher than that of zebu animals and these grade animals also showed a much lower efficiency of adaptation to changes in their environment.—ALFRED EDEN.

CASKEY, C. D., & NORRIS, L. C. (1940). **Micromelia in Adult Fowl Caused by Manganese Deficiency During Embryonic Development.**—*Proc. Soc. exp. Biol., N.Y.* **44.** 332–335.

Newly hatched chicks which became micromelic during embryonic development, due to manganese deficiency, did not recover from the micromelia even when fed a diet containing adequate Mn for approximately 16 months. Measurements of the bones showed that the lengths of the sterna were not affected by the embryonic Mn deficiency. This difference in the effect on the bones of the legs and wings and on the sternum may be related to the degree of calcification occurring in these bones during the latter stages of embryonic development.—R. ALLCROFT.

SILBERBERG, M., & SILBERBERG, Ruth. (1940). **Changes in Cartilage and Bone of Immature Female Guinea Pigs Due to Undernourishment with Consideration of the Processes of Repair Following a Period of Refeeding.**—*Arch. Path.* **30.** 675–688. [Authors' summary copied *verbatim*].

In growing female guinea pigs underfeeding causes atrophy of the cartilage cells and increased sclerosis of the matrix of the growth zones. The proliferation of the cartilage and its ossification continue, but endochondral and periosteal bone formation proceed at a diminished rate, the degree of diminution depending on the degree of underfeeding.

On refeeding, the sclerosis of the matrix disappears and the cartilage cells reassume their normal appearance. Overproduction of cartilage cells and bone occurs during an early period of refeeding; at later stages normal conditions are restored. No lines of arrested growth or changes which could be interpreted as forerunners of such lines could be observed.

BARNES, R. H., DRURY, D. R., GREELEY, P. O., & WICK, A. N. (1940). **Utilization of the Ketone Bodies in Normal Animals and in those with Ketosis.**—*Amer. J. Physiol.* **130.** 144–150.

Simultaneous determinations were made of the O_2-carrying capacity and total ketone bodies of the blood in the femoral artery and vein of animals (rabbits, dogs, and a goat) in a state of ketosis caused by phloridzin or pancreatic diabetes. The average fraction of the O_2 difference utilized by burning the ketone bodies was 44%. Normal animals injected with β-hydroxybutyric acid had no greater capacity for utilizing ketone bodies than had animals with ketosis. The view is put forward that the production of ketone bodies by the liver and their utilization by the other tissues is an important, though not necessarily inevitable, route for the catabolism of fatty acids. When animals are in a state of ketosis increase in the metabolic rate probably increases the rates of production and utilization of the ketone bodies.
—ALFRED EDEN.

WICK, A. N., & MACKAY, E. M. (1940). **Influence of Age on Ketosis.**—*Amer. J. Physiol.* **130.** 332–334.

The blood ketone bodies and liver glycogen were determined at known intervals in groups of male rats of the same litter, which at different ages were fasted for periods up to 94 hours. It was found that the fasting ketosis increased less rapidly with increasing age, but that after 48 hours' fasting the degree of ketosis was a similar maximum at all age levels. The decrease in liver glycogen on fasting was less for older than for young rats, but at all ages this glycogen reached a minimum after 24 hours' starvation and then tended to increase

for the next three days.—ALFRED EDEN.

HOWELL, C. E., HART, G. H., & ITTNER, N. R. (1941). **Vitamin A Deficiency in Horses.** —*Amer. J. vet. Res.* **2.** 60–74.

This paper provides a well-illustrated description of the symptoms and lesions exhibited by the vitamin A deficient Percheron horses employed to assess the minimum requirements of this species for the vitamin [see also *V. B.* **11.** 252]. The primary symptom, night blindness, was followed by lachrymation and corneal keratinization, but not by xerophthalmia or by bony overgrowth of the optic canals. All the animals but one (which died at an early stage from encephalomyelitis) developed typical joint lesions which did not, in the two cases treated at a late stage, respond to vitamin A therapy. These lesions, which included ulceration of the articular surfaces, were not influenced by altering the Ca : P ratio of the diet, and were not accompanied by any departure from normal blood Ca, P, or Mg values, or by marked skeletal alterations, except in one case. Nevertheless, the authors are cautious in ascribing the joint lesions to a primary vitamin A deficiency, although the evidence is not against this conclusion.

A marked dyspnoea was exhibited by several animals, one of which made a few whistling sounds, and one filly manifested an " atypical " shivering and stringhalt. The hooves of one animal in particular showed a marked scaling of the periople. These occurrences are discussed in relation to the hypotheses of MITCHELL [see *V. B.* **7.** 485.] and to the findings of KLEMOLA [*V. B.* **9.** 419.] and others, but the authors are careful not to draw definite conclusions. They maintain, however, that rations commonly used in the U.S.A. for horses are liable to be deficient in vitamin A where yellow maize is not available.—A. N. W.

CANNON, M. D. (1940). **Failure of Maternal Vitamin A Depletion to Produce Congenital Anomalies in the Young of Rats.** —*Proc. Soc. exp. Biol., N.Y.* **44.** 129–132.

Maternal vitamin A deprivation did not induce any anomalies in the young of rats, and it is concluded that if rat females have sufficient vitamin A to enable them to bear any young, their offspring are anatomically normal. It is stated that sheep and cattle appear to behave similarly. Females depleted of A severely enough to show xerophthalmia or weight loss, refused to mate; of the mated animals those with greatest A deficiency resorbed their foetuses; those with less severe A deficiency gave birth to dead foetuses with difficult and protracted labour after a prolonged gestation, or showed only prolonged gestation periods. —R. ALLCROFT.

CORNIL, L., CHEVALLIER, A., & PAILLAS, J. E. (1939). Étude histologique des lésions expérimentales de la survitaminose A chez le cobaye. **[Histological Study of Experimental Hypervitaminosis A in G. Pigs].**—*Ann. Anat. path. méd.-chir.* **16.** 74–83.

Male g. pigs on a synthetic diet from which all green stuff was excluded but with the daily addition of 400 mg. vitamin A concentrate, lost weight and died within 15–19 days; with a lighter hypervitaminosis A the animals gained in weight and when green stuff was added to the diet the state of hypervitaminosis appeared only after several months. The main lesions found P.M. were in the liver, lungs, kidney, pancreas, testes, and hypophysis; for full details of the histopathology the reader is referred to the original.—ALFRED EDEN.

I & II. CARLSTRÖM, B., MYRBÄCK, K., HOLMIN, N., & LARSSON, A. (1939). Biokemiska studier rörande B_1-avitaminos hos djur och människor. **[Biochemical Studies on Avitaminosis-B_1 in Animals and Man].**—*Skand VetTidskr.* **29.** 403–444 and 589–597. [English summary to first part].

III. CARLSTRÖM, B. (1940). Verkan av aneurin, cocarboxylas och pyrofosfat vid B_1-avitaminos. **[Action of Aneurin (B_1), Cocarboxylase and Pyrophosphate in B_1-Avitaminosis].**—*Ibid.* **30.** 738–750. [English summary].

IV. CARLSTRÖM, B., & LÖVGREN, O. (1940). Några kliniska iakttagelser angående effekten av pyrofosfat som komplement till aneurinbehandling. (Förutskickat meddelande). **[Some Clinical Observations on the Effect of Pyrophosphate as a Supplementary Remedy in Aneurin Treatment].**—*Ibid.* 751–758. [English summary].

I. The origin of vitamin B_1 deficiency is discussed and a review given of the results of blood analyses to determine certain intermediary products of carbohydrate and fat metabolism in man and animals affected with the following disorders. In man :- muscular disorders, neuritis, constipation, tonic spasm of

the intestine, bradycardia (from pancreatic origin), chronic polyarthritis, chronic muscular rheumatism, hyperemesis gravidarum, pregnancy toxaemias, acute influenza, and rheumatic pains. In horses :– fatty infiltration of the liver, haemorrhagic encephalitis, paralytic myoglobinuria, and polymyositis. In cattle :– acetonaemia. In silver foxes :– deficiency disease with convulsions.

The blood analyses consisted of the following determinations :– total acetone, lactic acid, pyruvic acid, bisulphite-binding substances, β-hydroxybutyric acid, and in some cases α-ketoglutaric acid. It was found that in all the cases investigated in man and animals there was an increase in pyruvic and lactic acids and in some instances in the acetone bodies. The acetone bodies appeared to vary in the different species studied, *e.g.* in cattle the increase was very marked, in horses there was no increase, while man and carnivorous animals appeared to occupy an intermediate position between the two. The amount of α-ketoglutaric acid was found to be high in some cases of acetonaemia in cattle. Treatment of all these conditions with aneurin (B_1) caused a disappearance of the clinical symptoms and a return to normal of the various blood constituents studied. From these results the authors consider that these conditions may be regarded as cases of B_1 deficiency.

II. In a discussion on I HOLMIN described a few cases of arthritis and neuritis in human beings who recovered after treatment with aneurin. WALL suggested that some forms of bovine mastitis and retention of the placenta, egg bind in fowls, and some forms of digestive disorder are basically due to avitaminosis B_1. SAHLSTEDT described a case of asthenia in a monkey which recovered after vitamin B_1 therapy.

CARLSTRÖM in reply stated that avitaminosis B_1 was certainly concerned with some complications of infectious diseases in horses, such as whistling. He suggested that the idea that whistling or roaring is hereditary is probably correct and that the animals concerned have a familial predisposition to be affected with vitamin B_1 deficiency. This is supported by observations on human families and on acetonaemia in cattle. Constipation and intestinal obstruction in horses is often due to lack of B_1 and an intravenous dose of aneurin causes powerful peristalsis. Yeast is also known to be useful in this connexion. Fatty infiltration of the liver is a constant sign of B_1 deficiency in cattle with acetonaemia, in foxes with cramps and in mink with acidosis. In horses it is less in evidence. Acetone formation does not run parallel to fatty infiltration of the liver.

III. In continuation of work reported above, C. now provides evidence which suggests that milk fever in cows is a B_1 deficiency. The disease, which used to affect 40% of the cows in a herd in the winter season, ceased after brewer's yeast was added to their rations; moreover, aneurin has been found to give a prompt cure in milk fever cases after calcium therapy and udder insufflation have failed. Aneurin also cures acidosis in mink.

C. further discusses the mode of action of aneurin in the body and its relation to co-carboxylase and carboxylase. On the basis of this theory, C. used co-carboxylase in the treatment of hyperemesis gravidarum in women, which has been found to respond somewhat to aneurin therapy. Synthetic co-carboxylase containing some pyrophosphate gave better results, whilst the same containing no pyrophosphate was not as effective. (Unpurified co-carboxylase caused a long lasting local reaction after subcutaneous injection, whilst the purified substance did not.) Cases of hyperemesis treated unsuccessfully with aneurin also recovered rapidly after pyrophosphate therapy and it was assumed that these two substances in combination give the best results in B_1 deficiency. The mechanism of this action is discussed. Pyrophosphate is believed to be of key importance in the formation of a number of enzymes in addition to co-carboxylase, and hence gives better therapeutic results than the latter. It acts in very small doses.

IV. The authors give further instances in which aneurin has failed to effect a complete cure of B_1-deficient conditions, but in which rapid and complete recovery occurred when pyrophosphate was given in addition to aneurin.

The cases included one dog with nervous system disorder after recovery from distemper, and seven persons affected with sciatica, trigeminal or brachial neuralgia, post-diphtheritic neuritis, or diabetes mellitus.

In discussing these experiences the authors state that cases of acute B_1 deficiency commonly respond completely to aneurin alone, but cases of chronic B_1 deficiency do not respond well or else relapse under aneurin therapy. Pyrophosphate appears to be unavailable in such

cases and must be administered. In any case a long course of aneurin + pyrophosphate therapy is, on clinical grounds, contra-indicated. Orthophosphate cannot replace pyrophosphate.

[No details are given of the diets on which the animals were maintained but the climatic conditions of Sweden and the resulting seasonal dietaries of the animals should be taken into account when these conclusions are considered.]

CARLSTRÖM, B. (1940). Om B_1 -avitaminos hos hund. [**Avitaminosis B_1 in Dogs**]. —*Skand. VetTidskr.* **30.** 724–737. [English summary].

Both primary and secondary avitaminosis B_1 occur in the dog. When B_1 is deficient, pyruvic acid, a product of CHO metabolism, cannot be consumed or broken down. It accumulates in the blood and has a noxious influence on the body, acting apparently on different organs in different cases, as befits the very varied syndromes encountered.

C. estimates that a medium sized dog requires 100 I.U. of B_1 daily: this is contained in a ration of 150 g. raw meat, 100 g. bread, and 200 g. milk.

Muscular symptoms of B_1 deficiency in dogs take the form of "rheumatic myositis or myalgia" wherein the muscles, particularly of the thigh and back, become tender, hard, and stiff and the dog shows morning stiffness or may be unable to rise. Nervous symptoms are neuritis and paraesthesia, whereby the dog shows pain and loss of function of the part (limb, jaw, vocal chords, etc.), ataxia and tonic-clonic cramps, when the spinal chord is affected, and death apparently from encephalitis, when the brain is affected.

Finally there is the primary B_1 deficiency affecting the liver with the clinical picture of toxic liver dystrophy. It is acute and causes death in 1–4 days. Case records illustrating these various manifestations in different animals are included. Their connexion with B_1 was proved by the finding of excess pyruvic acid in the blood and by treatment with aneurin, the response being spectacular.

Cases of B_1 deficiency apparently involving the brain were observed in foxes, some of which died and were found to have serous meningitis and non-purulent encephalitis. Survivors recovered quickly after receiving aneurin [see also *V. B.* **8.** 655, and **9.** 885].—J. E.

MCKIBBIN, J. M., BLACK, S., & ELVEHJEM, C. A. (1940). **The Essential Nature of Pantothenic Acid and Another Alkali Labile Factor in the Nutrition of the Dog.**—*Amer. J. Physiol.* **130.** 365–372.

Data are presented which show that in addition to factor W, pantothenic acid and another alkali labile factor are necessary in the nutrition of the dog. The immediate temporary response to injections of purified pantothenic acid concentrates of all the dogs used indicated that this factor is essential, but the nature of the other essential alkali labile factor is not yet known.—R. ALLCROFT.

FAIRBANKS, B. W., & CURZON, Elizabeth. (1940). **Nicotinic Acid and Necrotic Enteritis in Swine.**—*N. Amer. Vet.* **21.** 536–538.

A brief review of recent publications, and in particular of that by DAVIS and co-workers [*V. B.* **11.** 316.] A short account is given of the apparent protection against symptoms of necrotic enteritis afforded by the administration of nicotinic acid to some of a litter of young pigs. Apart from this, no original work is reported.—ALASTAIR N. WORDEN.

BELLER, K., & RENKERT, O. (1940). Ueber den Vitamin C-Bedarf des Pferdes in Bezug auf den ansteckenden Katarrh der Luftwege. [**Connexion between Vitamin C and Equine Influenza**].—*Z. Veterinärk.* **52.** 121–126. [Translation of abst. in *Zbl. Bakt. I.* (*Ref.*). **138.** 379].

Intravenous administration of large doses of vitamin C as "Cebion P" Merck (20% ascorbic acid) to healthy and sick horses, resulted in the rapid excretion of vitamin C in the urine. Excretion was not demonstrably different in horses with acute or chronic disease conditions nor in healthy animals. From this it is suggested that there are no grounds for supposing that avitaminosis C occurs in infectious catarrh of the respiratory tract in horses. [Orig. not available.]

MARTIN, G. (1941). **The Use of Osteotropic Dyes in a Modified Line Test for Vitamin D.**—*J. Lab. clin. Med.* **26.** 714–719. [Author's summary copied *verbatim*].

A modified line test involving the use of an osteotropic dye, alizarin, is introduced. Greater specificity, greater applicability, and greater speed result from its use.

MACKENZIE, C. G., MACKENZIE, Julia B., & MCCOLLUM, E. V. (1940). **Occurrence of Tremors and Incoördination in**

Vitamin E-Deficient Adult Rats.—*Proc. Soc. exp. Biol., N.Y.* **44.** 95–98.

Paralysis of the hind legs was produced within 8–10 months in rats maintained on a highly purified vitamin E deficient diet. As paralysis progressed tremors and incoordination of the forelegs and head also developed. Microscopic examination of the thigh muscles showed lesions similar to those described by other workers [see *V. B.* **8.** 800, and **10.** 289.], but not as marked as those occurring in young rabbits with severe muscular dystrophy. Administration of vitamin E concentrate arrested the development of the symptoms and stimulated growth but did not cure the condition.—R. ALLCROFT.

BRINKHOUS, K. M., & WARNER, E. D. (1941). **Muscular Dystrophy in Biliary Fistula Dogs: Possible Relationship to Vitamin E Deficiency.**—*Amer. J. Path.* **17.** 81–86.

The lesions observed in chronic biliary fistula dogs maintained on an adequate diet were similar to those described in the nutritional muscular dystrophy of rabbits and g. pigs [see *V. B.* **9.** 883]. It is suggested that the dystrophy is due to a vitamin E deficiency resulting from faulty absorption of fat-soluble substances in the absence of bile in the intestine. —R. ALLCROFT.

MORGULIS, S., & RICHARDS, C. E. (1940). **Nutritional Muscle Dystrophy and Sex Hormones.**—*Endocrinology.* **27.** 522–523.

It has been noticed that the gonads of rabbits with nutritional muscle dystrophy undergo a marked and progressive diminution in the course of the development of the disease. To investigate the effect of gonadal stimulation on this disorder, two series of rabbits were maintained on a muscular dystrophy producing diet. Thirty out of 40 animals in the first series were given intramuscular injection of testosterone propionate and ten out of 15 in the second series were given injections of anterior pituitary gonadotrophic factor, the remaining animals in both series being controls. In both series there was no difference in the onset of the disease between the treated and control animals. It is concluded that conditions which favour development of nutritional muscular dystrophy may also cause atrophy of the gonads, but that hypogenitalism cannot be considered as a factor in producing the dystrophy.—R. ALLCROFT.

MEUNIER, P., HINGLAIS, H., BOVET, D., & DREYFUSS, A. (1940). Sur l'activité antihémorragique de la 2-méthyl-1·4-naphtoquinone chez le lapin et la possibilité d'une hypervitaminose K. [**Anti-haemorrhagic Activity of 2-Methyl-1 : 4-Naphthoquinone on the Rabbit and the Possibility of Hypervitaminosis K**].—*C. R. Acad. Sci., Paris.* **210.** 454–457.

Single doses of 1–10 mg. of 2-methyl-1 : 4-naphthoquinone, administered subcutaneously as a solution in glycol monoacetate, were found to restore to normal the clotting times of the blood of rabbits previously rendered icteric by surgical interference or by intoxication with chloroform or with *p*-toluylene diamine. With 10 mg. doses, however, the recovery was temporary, and was succeeded in about 18 hours by a delay in clotting greater than that which was present before treatment. This effect, which the authors regard as a manifestation of hypervitaminosis K, was obtained with still larger doses in glycol monoacetate solution, but was less marked when oil was used as the excipient.

It is suggested that a rabbit intoxicated by *p*-toluylene diamine could serve as a test animal for vitamin K.—ALASTAIR N. WORDEN.

PUBLIC HEALTH

GUERRIERO, F. (1939). Ricerche del bacillo tubercolare nel latte della Campania prima e dopo la pasteurizzazione. Presenza di bacilli tubercolari anche tipo umano. [**Tubercle Bacilli in Milk in Campania before and after Pasteurization. Presence of Human Type Bacilli**].—*G. Batt. Immun.* **22.** 476–498. [English, French and German summaries].

In order to detect the presence of tubercle bacilli in milk samples, inoculation into two g. pigs was practised without the addition of acid or alkali to the milk, one animal being killed after 35–45 days, and the second in the course of the fourth month. Out of 28 samples of mixed milk, nine were found to be infected, and of milk from individual cows one sample out of 14 was infected. Tubercle bacilli were not detected in any of the eight samples of

pasteurized milk. Two of the infected mixed milk samples contained bacilli of the human type, as judged by cultural tests and rabbit inoculation, and in one case, a second sample taken from the same milk 37 days later again revealed bacilli of the same type.—U. F. R.

O'Droma, L. (1940). **Haemolytic Organism Isolated from Pasteurized Cream.**—*J. Dairy Res.* **11.** 37–42.

A description is given of a weakly haemolytic organism appearing as a contaminant in agar plates inoculated from a sample of cream. Whilst in many respects the organism resembles certain strains of *Streptococcus bovis* recently isolated from pasteurized milk in America, it is thought that it more closely resembles a resistant form of *Str. thermophilus*, the churn becoming infected through the medium of a cream inefficiently pasteurized.—H. V. Hughes.

THERAPEUTICS

McCulloch, E. C. (1940). **The Efficiency of Soaps and Other Disinfectants in Destroying Mastitis Streptococci.**—*Amer. J. vet. Res.* **1.** 18–22.

It was found that solutions of commercial soaps and soap powders were 2–3 times as effective in killing mastitis streptococci in 1 min. as was phenol, and were equally as effective as 100 p.p.m. of several hypochlorites. Tests were carried out at 40°C. in the presence of 5% skim milk and 5% broth culture of the organisms. Soap containing cresols was not more germicidal than non-medicated soaps, and soaps containing mercury compounds were only slightly more effective. A soft soap usually called "green soap", tincture of green soap, and a coconut-oil base liquid soap were found to be inferior germicides against mastitis streptococci. No correlation was observed between the germicidal efficiency and the alkalinity of the mixture of soap solution, milk, and broth culture. High-test household lye was effective in dilutions of 1 : 300 and 1 : 500 which have a final pH of 11·18–11·22, but was much slower than the soaps in exerting a germicidal action.

It is concluded that soap solutions in the concentration usually obtained in lathering hands with soap in warm water are effective disinfectants against mastitis streptococci and may satisfactorily replace other disinfectants for the hands of milkers and the teats of the cows. Household lye is recommended as a disinfectant for dairy barns where it is necessary to destroy mastitis streptococci on the floors.

—R. Allcroft.

Erf, O. (1939). **Sulfanilamide: Pioneering in Mastitis Work.**—*Jersey Bull.* **4.** 1516 and 1549–1551.

Administration of sulphanilamide to a large number of cows affected with mastitis showed that the drug was efficacious in alleviating the symptoms caused by long-chain streptococci. Small doses had apparently no effect and the best results were obtained when a concentration of 4·5 mg. per 100 g. was maintained in the blood. Reappearance of streptococci in the milk occurred 3–4 weeks after administration of the sulphanilamide, but they were eliminated again after further administration of the drug. Of the large number of cows treated, only one was found to be sensitive to the treatment.

—R. Allcroft.

Bryan, C. S., & Arnold, J. J. (1940). **Sulphanilamide in the Treatment of Streptococcic Mastitis.**—*Vet. Med.* **35.** 508–510.

The authors fed sulphanilamide to cows with chronic mastitis in doses of 0·3 g., 0·6 g., and 1·2 g. per lb. body weight per day. Although the number of streptococci eliminated in the milk decreased during treatment, they subsequently returned to their previous levels. The authors therefore conclude that sulphanilamide is of no value in chronic mastitis. Sulphanilamide, given for 12 days at the rate of 0·6 g. and 1·2 g. per lb. per day to two cows respectively, was effective in relieving the systemic reactions in acute mastitis. Calcium gluconate is suggested as an antidote to sulphanilamide poisoning.—R. Fisher.

Schoepe, M. (1940). Therapeutische Erfahrungen mit Flavasid-Spülungen bei gelbem Galt. [**"Flavasid" Udder Irrigations for Mastitis**].—*Berl. Münch. tierärztl. Wschr.* April 5th. 160–161.

"Flavasid" is a proprietary preparation stated to contain, in addition to an acridine dye, substances having analgesic and local anaesthetic properties. It was used for udder infusion for mastitis in a dilution of 1 : 12,500. Thirty-two quarters of 16 cows affected with streptococcal mastitis (confirmed by bacteriological examination) were treated by udder

infusion of 200–300 c.c. of this solution. An average period of 10 min. was found to be sufficient, and a preliminary washing out was not an advantage. S. claims that 25 quarters were cured with one infusion and remained free for at least three months; five quarters required two treatments; one cow was sold owing to extensive induration of the udder, and one quarter of one cow became reinfected within three months. The treatment was claimed to cure clinical cases showing slight induration and an acute case was also cleared up. Oedematous swellings appeared in the udders of two cows after treatment, but these did not persist. The milk yield on the two days following treatment was not less than that on the previous day. Treatment was carried out without regard to the stage of lactation of the cow.—H. E. HARBOUR.

LITTLE, R. B., DUBOS, R. J., & HOTCHKISS, R. D. (1940). **Action of Gramicidin on Streptococci of Bovine Mastitis.**—*Proc. Soc. exp. Biol., N.Y.* **44.** 444–445.

The therapeutic effect of gramicidin (an alcohol-soluble substance isolated from cultures of a sporulating bacillus) upon chronic bovine streptococcal mastitis was investigated. The substance has been shown to exert a marked bactericidal effect against Gram-positive micro-organisms both *in vitro* and *in vivo*. Solutions of 6 to 24 per cent. in distilled water were used. Two cows well advanced in lactation and showing marked induration of the infected quarters were subjected repeatedly to intramammary injection of 800–900 c.c. of the preparation. The treatment failed permanently to eliminate the organisms. Nine quarters of three cows less advanced in lactation and with only moderate induration were then treated. Of these two quarters failed to respond, one quarter was sterilized after five injections, and the other six after a single treatment. Further investigations are being made.—D. D. OGILVIE.

HIGNETT S. L. (1940). **Sulphanilamide in the Treatment of Equine Diseases.**—*J. R. Army vet. Cps.* **12.** 3–16.

Sulphanilamide is the most useful member of the sulphonamide group in veterinary practice and is effective against some organisms of high virulence. No sulphates should be allowed during its administration. Should sulphates have been given and resultant counter-treatment be required the antidote is sodium bicarbonate. A blood concentration of sulphanilamide of 10 mg.% or more is necessary, obtained by an initial dose of 3·5 drachms per cwt. body weight followed by daily doses of 1 drachm per cwt. body weight. Fat horses should be given smaller doses as in fat and bones the concentration of sulphanilamide is low. It should also be administered with care in cases of nephritis. Sulphanilamide appears to be of little use against strangles, but is of great value in pneumonia, and encouraging results have been obtained in metritis.—R. F.

DITTMAR. (1940). Zur Behandlung der Druse mit 33 prozentigem Alkohol und mit Chinin-Alkohol. **[Treatment of Strangles with 33 per cent. Alcohol and with Quinine-Alcohol Mixture].** — *Z. Veterinärk.* **52.** 126–139. [Abst. from abst. in *Zbl. Bakt. I. (Ref.).* **138.** 378–379].

Intravenous injections of 33% alcohol with quinine hydrochloride dissolved therein had no curative effect against strangles, pharyngitis, pneumonia, or purpura. On the contrary they lowered the general state of health.

FLIPPIN, H. F., FORRESTER, J. S., & FITZ-HUGH, T., Jr. (1940). **Sulfapyridine in Experimental Tuberculosis.**—*Amer. Rev. Tuberc.* **42.** 821–823.

Fifteen adult g. pigs were injected with human type tubercle bacilli and divided into three groups. Group I (control) received no therapy, group II received a total dose of 2·5 g. of sulphapyridine orally over a period of ten days, and group III was untreated for two weeks after inoculation and then a total dosage of 2 g. was given in two doses daily of 100 mg. each. After four weeks all the g. pigs were killed, the spleens removed, suspensions made from the ground material, and the cultures incubated for six weeks. There was no significant difference between the number of colonies recovered from the spleens of treated and untreated animals and hence no evidence that oral administration of sulphapyridine has any inhibitory effect on the spread or viability of *Mycobacterium tuberculosis*.—R. ALLCROFT.

FIORIO, C. (1939). Chemioresistenza dei micobatteri del tubercolo e loro comportamento biologico. **[Drug-Resistance of Tubercle Bacilli and Their Biological Behaviour].**—*G. Batt. Immun.* **22.** 618–654. [English, French and German summaries].

F. divides strains of tubercle bacilli into those with great resistance to acids and alkalis and

those with little resistance, the former being strains which resist concentrations of sulphuric acid greater than 10%, and of caustic soda greater than 4%, for long periods, without such exposure adversely affecting their ability to develop readily in cultures. He further subdivides into strains which resist both acid and alkali, strains which are solely or principally resistant to acid, and those which are solely or principally resistant to alkali. In attempting to ascertain whether the biological characters of strains are correlated with their acid or alkali fastness, he investigated the drug resistance of strains from mild and acute cases of human infection, and also the severity of the disease produced in g. pigs by the various types of organisms under observation.

He concludes that there is no correlation between the drug resistance of strains and their biological characters or their virulence. Virulence is judged by the length of time the g. pig survives after inoculation, and the severity of the disease is represented by the loss of weight of the animal and the gravity of the lesions produced.—U. F. Richardson.

Coplans, M. (1940). **Chemotherapy of the Experimental Typhoid and Paratyphoid Carrier Condition in the Immature Rabbit.**—*J. Path. Bact.* **50.** 507–526.

The method previously described for establishing a chronic faecal and urinary carrier condition of *Salmonella typhi* by the intravenous injection of a suspension of the organism in the immature rabbit has been extended to *Salmonella paratyphi A* and *B*. The condition in the latter infections has been found to be equally controllable by the oral administration of hexamine combined with sodium acetate, and the beneficial cumulative action of this treatment has been observed.—J. M. Robson.

Crawford, A. B., & Beach, B. A. (1940). **Ineffectiveness of Proprietary Remedies and other Drugs in the Control of Bang's Disease, with Special Reference to "3-V Tonic" and "Bowman's".**—*J. agric. Res.* **60.** 565–574.

The authors conducted experiments with two widely advertised abortion remedies. Both were first analysed. The Crawford "3-V Tonic" was found to contain lime, basic magnesium carbonate, charcoal, calcium hyposulphite, and small proportions of a few other similar ingredients. Bowman's product contained sucrose, invert sugar, wood creosote, and ash. Pregnant heifers, negative to the agglutination test, were divided into test groups and controls. The remedies were fed both before and after exposure to infection with *Brucella abortus*. They did not prevent infection and had no influence on the course of the disease. The blood titre was unaffected.—R. Fisher.

Farquharson, J. (1940). **Sulfapyridine in the Treatment of Calf Diphtheria.**—*J. Amer. vet. med. Ass.* **97.** 431–436.

Nine animals ranging in age from a bull calf six days old to a heifer 2½ years old, and diagnosed clinically as infected with *Actinomyces necrophorus* were treated with sulphapyridine. Eight of the nine cases showed laryngeal lesions without complications and the ninth was affected with necrotic vaginitis. Treatment was initiated in all cases by intravenous injection of 0·06 g. sulphapyridine per kg. body weight which produced a blood concentration of the drug from 6·7–8 mg. %. This treatment was followed by oral administration of 1 g. per lb. body weight of sulphapyridine given in three doses every four hours and continued for 3–4 days, when the dose was reduced to one half for a further 2–3 days. Twenty-four hours after treatment was begun a marked improvement was noted in all cases and after an average of six days' treatment all the animals appeared normal; in only one case was there a relapse. These results indicate the use of sulphapyridine in the treatment of calf diphtheria and perhaps in other infections associated with *A. necrophorus*.—R. Allcroft.

Stafford, Jane. (1940). **A New Sulfa Drug.**—*Science.* **92.** Dec. 20th. Suppl. p. 9.

Sulphanilylguanidine is fairly soluble in water, but is poorly absorbed from the digestive tract so that most of it reaches the lower part of the alimentary canal. Administration of the drug in man caused a marked fall in the number of organisms in the alimentary canal, thus reducing the risk of sepsis in operations on the intestine. It is also at present being used for the treatment of bacillary dysentery.—J. M. R.

P'an, S. Y. (1939). **Observations on the Chronic Effect of Sulfanilamide in Dogs and Monkeys with Particular Reference to the Blood.**—*Chin. med. J.* **56.** 111–121. [In English]. [Author's summary copied *verbatim*].

(1) Different doses of sulfanilamide were fed to four dogs and two monkeys for a period of three months and its effects on the blood picture, blood sugar, liver and kidney functions

as well as general toxic effects were studied. (2) Anaemia of varying degree was observed in all the monkeys and dogs. (3) Leucopenia was observed in two and granulocytopenia in one of the dogs. (4) Transient spastic motor paralysis of the hind limbs and marked impairment of liver function occurred concomitantly in one dog.

HIGGINS, G. M., & MACHELL, T. E. (1939). **The Bone Marrow of Rats made Anemic by Administration of Sulfanilamide.**—*Anat. Rec.* **75.** 529–536. [Authors' summary copied *verbatim*].

Bone marrow preparations of white rats which were given daily doses of sulfanilamide (1 gm. per kilogram of body weight) have been studied. Imprint preparations were made of femoral marrow removed from animals killed on the fourth, sixth, eighth, tenth, twelfth and fourteenth days respectively. The differential percentage distribution of the cells comprising the marrow was established and these data were compared with those assembled from the marrow preparations of three control animals which had not received sulfanilamide. The following observations and deductions have been made.

1. On the basis of the relative distribution, there is, after 4 days of administration of the drug, a greater myeloid stimulation than erythroid stimulation.

2. At 6 days, when anaemia in the peripheral blood was seriously indicated, we observed that the erythroid stimulation was relatively greater than the myeloid stimulation.

3. The myeloid-erythroid ratio, whereas normally greater than one, was always less than one from the sixth day of the experiment to the end.

4. Eosinophilic stimulation in the bone marrow was not apparent.

5. The frequent appearance of multilobular granulocytes in smears of the peripheral blood of animals receiving sulfanilamide seems to be explained on the basis of the early modifications in the nuclear patterns of the promyelocytes and myelocytes.

RICHARDSON, A. P. (1940). **Effects of Continued Administration of Sulfanilamide on the Blood.**—*J. Pharmacol.* **70.** 370–377.

The continued administration of sulphanilamide in the diet to mice produced a secondary anaemia closely resembling that resulting from clinical medication. There was reticulocytosis, increase in mean corpuscular volume of the erythrocytes, development of Heinz bodies and marked deposits of haemosiderin in the spleen. A given concentration of sulphanilamide produced maximum blood changes within 2–4 weeks, beyond which time continued administration of sulphanilamide produced no further anaemia. Splenectomy had no effect on the development of anaemia or cyanosis.—J. M. ROBSON.

MERZDORF, G., & WICHERN, H. (1939). Zur Behandlung der Aktinomikose bei Rind und Schwein mit Katusan (P.I.W.) **[Treatment of Actinomycosis in Cattle and Pigs with Katusan (P.I.W.)].**—*Dtsch. tierärztl. Wschr.* **47.** 477–479.

Katusan is an emulsion of living Timothy grass bacilli. The material was injected subcutaneously into 13 affected bovines and seven affected pigs. It is stated without any proof being provided that some of the animals were cured.—J. R. M. INNES.

I. HAWKING, F. (1940). **Trypanocidal Activity and Arsenic Content of the Cerebrospinal Fluid of Sleeping-Sickness Patients, after the Administration of Tryparsamide.**—*Trans. R. Soc. trop. Med. Hyg.* **34.** 269–280.

II. HAWKING, F. (1941). **Trypanocidal Activity and Arsenic Content of Human Blood after Administration of Tryparsamide.**—*Ibid.* 305–310.

I. A continuation of the work reported in *V. B.* **8.** 44, and **10.** 56. Estimation, after the administration of tryparsamide, of the trypanocidal activity *in vitro* and total arsenic content of the C.S.F. of patients suffering from sleeping sickness caused by *T. rhodesiense* showed that these quantities were similar to those observed in patients in a British mental hospital with approximately normal cerebral membranes. Therefore comparisons of different arsenical compounds, conducted by this technique in temperate countries on patients with approximately normal C.S.F. are applicable to the use of the same compounds in the treatment of sleeping sickness.

Experiments showed that local strains of *T. rhodesiense* respond much less readily to tryparsamide which has penetrated into the C.S.F., than an old laboratory strain (Liverpool) does. Insignificant degrees of trypanocidal activity were produced in the C.S.F. of patients treated with neocryl or with undecane diamidine,

II. After intravenous injection of tryparsamide into human subjects, measurements were made of the power of the plasma to kill trypanosomes of a serum-resistant strain of *T. gambiense*. There was considerable individual variation, but trypanocidal activity was absent immediately after injection and rose to a maximum at 24–48 hours after which it gradually diminished until after four days it was inappreciable. The results of a small number of blood arsenic estimations showed that tryparsamide disappears very rapidly from the blood after injection. The trypanocidal activity in the blood was higher than that observed previously in C.S.F. [see I], but the time relations were approximately similar. Preliminary experiments indicated that neoarsphenamine produces much greater activity in the blood than does tryparsamide. These results confirm those obtained by MURGATROYD, RUSSELL & YORKE [*V.B.* **5.** 847.]—R. A.

ACRES, I. S. (1940). **Further Observations on the Treatment of Sleeping Sickness with Neocryl.**—*Trans. R. Soc. trop. Med. Hyg.* **34.** 281–289.

Examination of 21 cases of sleeping sickness which had been treated 2–3 years previously with neocryl confirmed clinically the observation made by HAWKING, HENNELLY & QUASTEL [*V. B.* **8.** 44.] that the trypanocidal activity of C.S.F. is less in the case of neocryl than of tryparsamide.—R. ALLCROFT.

EVANS, S. A., & HORNBY, H. E. (1939). **An Experiment to Determine if Liver Derangement during Treatment of *T. congolense* Disease Influences the Trypanocidal Action of Antimony.**—*Rep. Dep. vet. Sci. Tanganyika, 1938.* Pt. II. pp. 7–9.

In previous investigations on treatment of trypanosomiasis with Sb there had been indications that liver degeneration might have had some trypanocidal effect, or have favoured the action of the drug in some way. To test this point further, goats were inoculated with *T. congolense* and were then given enough carbon tetrachloride to upset the livers to a certain extent. Periodic determinations were made of the number of trypanosomes in the blood, and antimosan therapy was then commenced. It was found that not only had the liver derangement by itself no effect, but that it actually appeared to diminish the subsequent therapeutic action of Sb preparations, possibly through decreasing antibody formation, without which this therapy cannot be completely successful.—ALFRED EDEN.

CHIARI, B. (1939). L'impegio dell'acaprin nella pratica della siero-infezione contro la peste bovina. **[Acaprin Treatment for Piroplasmosis in Rinderpest Virus Producers].**—*Bol. Soc. ital. Biol. sper.* **14.** 358–360.

In an attempt to eliminate piroplasms from the virus used for rinderpest double inoculation, acaprin was administered to virus producers showing babesial infections. In the case of *B. bigemina*, organ emulsions taken from animals 40 hours after acaprin treatment had been given did not produce infection. In one experiment, in which one of the small type babesia was involved, five calves inoculated with rinderpest blood virus taken from an animal before acaprin treatment, developed acute piroplasmosis and three died, whereas nine calves inoculated with virus drawn 24 hours after the acaprin treatment all escaped piroplasmosis, and only one died from the rinderpest reaction.—U. F. RICHARDSON.

SWANSON, L. E., HARWOOD, P. D., & CONNELLY, J. W. (1940). **Phenothiazine as an Anthelmintic for the Removal of Intestinal Worms from Swine.**—*J. Amer. vet. med. Ass.* **96.** 333–338.

The authors describe experiments to test the value of phenothiazine as an anthelmintic for swine, and its efficiency is compared with that of oil of chenopodium. Conditioned phenothiazine was given in doses of 0·25–0·9 g. per lb. body weight, and the recrystallized substance in doses of 0·05–0·2 g. per lb. body weight, both after fasting. The doses were administered in the food or in hard gelatin capsules. All faeces were examined for worms for a week after dosing and the pigs were then killed and all the remaining worms counted.

These counts showed the recrystallized product to be slightly superior, having an efficiency of 92·3% against nodular worms (*Oesophagostomum* spp.), and 58·9% against mature ascarids. Neither product was effective against stomach worms, hookworms, or acanthocephala. Phenothiazine was far more efficient against nodular worms than was oil of chenopodium, while both drugs were about equally effective against ascarids, phenothiazine being better in heavier, and chenopodium in the lighter infestations. Advantages of using phenothiazine were its lack of after effects, and

the practicability of administering it in the food.

Doses of 5 g. or more per animal were the most successful, but as further investigations are necessary on the dose rate, the treatment is not recommended unconditionally.—K. M. S.

ROBERTSON, D. (1941). **Field Trials on the Use of Phenothiazine Against Worms in Sheep.**—*Vet. Rec.* **53.** 47–49.

R. describes experiments which indicate (1) that monthly doses of 0·1 g. phenothiazine per lb. body weight, given in tablet form, have no effect on the weight increase or stomach worm burden of healthy lambs, and (2) that monthly doses of " phenovis " (finely powdered phenothiazine suspended in water containing a dispersing agent) equivalent to 0·25 g. per lb. body weight are a highly successful remedy for sheep heavily infested with *Chabertia ovis*, and that monthly doses of " phenovis " equivalent to 0·5 g. per lb. body weight are successful in advanced stages of this infestation.—K. M. S.

WHITLOCK, J. H., & COX, R. (1940). **A Note on Phenothiazine Therapy in Sheep.**—*J. Amer. vet. med. Ass.* **97.** 436–437.

The oesophageal groove reflex is weakened in heavily parasitized sheep and there is some indication that rumination is retarded at the same time. The authors suggest that these factors, which would partially immobilize the drug in the rumen, may have been responsible for the low efficiency of phenothiazine reported by Singer & Baker [*V. B.* **11.** 59]. To test this theory, they sprayed the back of the oral cavity of four heavily parasitized lambs with 2·5 c.c. of 10% copper sulphate solution to stimulate closure of the oesophageal groove, and then administered phenothiazine at the rate of 0·5 g. per lb. body weight. In every case there was a great fall in the egg count and a marked clinical improvement in the treated animals.

—K. M. SANDERSON.

SABIN, A., & WARREN, J. (1940). **The Curative Effect of Certain Gold Compounds on Experimental, Proliferative, Chronic Arthritis in Mice.**—*J. Bact.* **40.** 823–856. [Abst. from authors' summary].

Certain inorganic and organic gold compounds of both the aliphatic and aromatic series have been found to exert a curative effect on an experimental proliferative, chronic arthritis in mice produced by a filtrable micro-organism of the pleuro-pneumonia group, which is a normal inhabitant of the upper respiratory tract of mice. Colloidal gold compounds were ineffective but administration of an insoluble organic compound, calcium aurothioglycolate, showed that enough active substance was absorbed over a period of weeks to bring about a complete and persistent curative effect. The greatest and most rapid response was obtained with the largest doses of the effective compounds; the same total dose administered over a short period gave better results than when given in smaller doses over a longer period of time. With doses on the borderline of effectiveness, recurrence was common after cessation of treatment. The earlier in the onset of the disease that treatment was begun, the more rapid and complete was the therapeutic response. Arthritis disappeared completely in 96% of 171 mice treated with suitable gold compounds in adequate dosage at the proper time; only 5% of 77 mice recovered which were treated with colloidal gold, bismuth subsalicylate, sodium salicylate, neoarsphenamine or sodium sulphapyridine, and only 7% of 70 mice which were untreated.

Toxicity and therapeutic effectiveness were not parallel; thus the therapeutic index for the double thiosulphate of gold and sodium (sanocrysin) was 2 and for sodium aurothiomalate (myochrysine) was 30 under identical conditions. [See also succeeding abst.]

SABIN, A. B., & WARREN, J. (1940). **The Therapeutic Effectiveness of a Practically Nontoxic New Compound (Calcium Aurothiomalate) in Experimental, Proliferative, Chronic Arthritis of Mice.**—*Science.* **92.** 535–546.

It has previously been shown that the intravenous injection of a " pleuro-pneumonia-like " micro-organism into mice produces a proliferative chronic arthritis very similar to human rheumatoid arthritis; organic gold compounds provided a curative action in this condition. It has now been shown that calcium aurothiomalate, in doses of 1 mg. or more, cured 90% of arthritic mice; toxicity tests were also made and 54 mice injected with 10–250 mg. of calcium aurothiomalate exhibited no obvious signs of illness over a period of six weeks or more.—J. M. ROBSON.

POISONS AND POISONING

JÖTTEN, K. W., VAN MARWYCK, C., & REPLOH, H. (1940). Ist die Erhöhung des Cu-Gehalt der Leber als Anzeichen einer Cu-Vergiftung zu werten. **[Is a Rise in the Copper Content of the Liver a Sign of Copper Poisoning?]**.—*Arch. Hyg., Berl.* **124.** 1–33.

A discussion of the probable changes in extent of pollution of atmosphere and surrounding vegetation by flue gases from copper works before and after reconstruction involving elevation of the chimneys above valley level and insertion of filter chambers. Protocols are provided on Cu and As content of chimney effluents, as well as on content in respect of dust particles, sulphur acids, HCl, free Cl, and CO. It is concluded that the modernized factories are no longer a source of danger.

With regard to alleged poisoning of stock, experiments on rabbits and g. pigs are described in which varying quantities of flue dust were fed, and from which it is concluded that there is less danger from Cu than from As, and that the Cu content of the liver in cases of unexplained death of stock in the vicinity of factories is not a reliable guide to diagnosis of actual copper poisoning. Normal animals often show high Cu values in the liver.—H. H. GREEN.

SCHUCK, Cecilia. (1939). **A Study of the Relative Toxicity of Sodium Fluoride in a Dry Diet, in Milk, and in Water.**—*J. dent. Res.* **18.** 491–496.

The results of experiments on groups of young rats which received 0·05% sodium fluoride incorporated in a dry diet, in evaporated milk, and in water, indicated that the toxicity was greatest when the fluoride was administered in water and least when given in a dry diet. Most of the rats receiving the fluoride in water died within two weeks; those on the fluoride-containing milk diet were able to survive, but the growth rate was markedly decreased; there was less depression of the growth rate in the group on the fluoride dry diet. No analysis of tissues was made, but dental signs of fluorosis occurred in all three groups, appearing earliest in the few surviving rats which received the fluoride in water.

—R. ALLCROFT.

ROHOLM, K. (1939). Fluorforgiftning ved anvendelse af knogleaske (benmel) som mineraltilskud. **[Fluorine Poisoning from Consumption of Bone Ash]**.—*Ugeskr. Laeg.* **101.** 535–540. [Abst. from author's English summary].

Bone ash has been used as a mineral addition to the diet in human therapeutics. Rats fed a bone ash preparation, *ebur ustum album*, containing about 0·1% fluorine absorbed part at least of the F and developed the characteristic tooth lesions. Children who received the preparation developed F poisoning.

I. WILSON, R. H., & DEEDS, F. (1940). **The Synergistic Action of Thyroid on Fluorine Toxicity.**—*Endocrinology.* **26.** 851–856.

II. DEEDS, F., WILSON, R. H., & CUTTING, W. C. (1940). **Thyrotropic Hormone and Fluorine Activity.**—*Ibid.* 1053–1056.

III. WILSON, D. C. (1941). **Fluorine in the Aetiology of Endemic Goitre.**—*Lancet.* **240.** 211–212.

I. If young rats could be induced to increase their daily food intake, then a diet which contained an amount of fluorine just insufficient to cause bleaching of the incisor teeth under ordinary conditions might result in the production of bleaching, since the concentration of F would remain the same, but the absolute amount ingested would be increased. In order to cause a greatly increased food intake one group of rats was fed 0·2% dried thyroid and a second group given injections of protamine zinc insulin twice daily, while a third group served as controls. All the rats were fed a basic diet containing 10 p.p.m. or 0·001% fluorine. Only the group receiving the dried thyroid exhibited marked bleaching of the incisor teeth. These results indicate that the bleaching was not due to the increased intake alone, but was due to a synergistic action of thyroid on fluorine poisoning. It appears that an induced pathological state of hyperthyroidism renders the organism more susceptible to a given F intake.

II. Young albino rats maintained on the basic diet described in I were given daily subcutaneous injections of thyrotrophic extract prepared from beef anterior pituitary glands ranging from 0·02–1 c.c. The rate of colouration of the incisor teeth was retarded in some cases while in others an actual bleaching occurred. It is suggested that the action of the hormone on tooth colour is effected through the stimulation of the thyroid gland.

III. It is shown that the geological distribution of fluorine in soils and drinking waters in the Punjab and in England is related both to the occurrence of dental fluorosis (mottled teeth) and to endemic goitre. The presence of F in drinking water as one factor in the causation of endemic goitre is suggested, but it is realized that the intervention of other factors operating against the production of goitre may completely overcome the action of fluorine in promoting it.—R. ALLCROFT.

ILJIN, N. A., HOFMAN, P., MELNIKOV, N. N., & AVETISIAN, A. M. (1938). **Morphogenetic and Toxic Activity of Monovalent and Trivalent Thallium Compounds.**—*Arch. int. Pharmacodyn.* **58.** 371–403. [In English]. [Abst. from author's summary].

The correlation between the chemical structure and the pilotropic and toxic action of thallium compounds was studied using the moult produced in angora rabbits as an assay of the activity of the compounds. The ten monovalent thallium compounds tested produced experimental moult similar to that produced by thallium acetate described previously by ILJIN (1932), and it was demonstrated that the degree of pilotropic and toxic action depends on the amount of Tl present, but not on the chemical structure of the compound.

Contrary to the opinion of BUSCHKE (1925), it was found that almost all the trivalent Tl compounds investigated produced a moult similar to that produced by the monovalent compounds, but the degree of pilotropic and toxic action did seem to depend on the chemical structure, because in secondary organic metallic compounds of the fatty acid series, both the pilotropic action and the toxicity increased with the elongation of the carbon chain. It was found that trivalent Tl salts possessed the greatest activity; the activity of primary compounds was somewhat lower while secondary compounds were least active. A modification in the chemical structure does not always lead to a parallel modification in the degree of pilotropic and toxic activity, but certain structural groups increase the pilotropic effect of these compounds. It is demonstrated that the pilotropic action is not a direct result of the toxic action of Tl.

MACLACHLAN, P. L. (1940). **Effect of Arsenicals on Liver Lipids of Rabbits.** —*Proc. Soc. exp. Biol., N.Y.* **44.** 429–431.

Liver injury in rabbits produced by intravenous injection of 250 mg. of arsphenamine or 375 mg. of neoarsphenamine per kg. body weight over a period of two weeks caused no significant change in the amount or distribution of the liver lipids.—R. ALLCROFT.

KHOLEVENKOV, D. S. (1940). O PVO na myasokombinate. **[Air Raid Precautions in Abattoirs].**—*Sovyet. Vet.* No. 5. pp. 19–20.

This paper deals chiefly with gas. Recommendations include the provision of large tanks, connected with the water mains in the upper storeys of buildings, which should be filled with decontaminants for the rapid treatment of plant and livestock when required. Shallow tanks filled with decontaminants should also be provided near the pens in order that animals which have had to be slaughtered can be passed through immediately so that they are "clean" before they are skinned, thus protecting the meat, the equipment, and contact workers.

Storage space and workshops should be gas-proofed and provision should be made for fire-fighting. No details are given. Emphasis is laid on the training of staff.

PHYSIOLOGY

I. DRINKER, C. K. (1938). **The Functional Significance of the Lymphatic System.** —*Bull. N.Y. Acad. Med.* **14.** 231–251.

II. DRINKER, C. K. (1939). **The Formation and Movements of Lymph.**—*Amer. Heart J.* **18.** 389–402.

I. It has been estimated that fluid equal to fifty times the total blood plasma may leave the capillaries and pass through the lymphatic system in 24 hours in frogs. It is possible in these animals to remove the albumin and globulin from the blood by draining lymph through a cannula in the crural lymphatics and gently infusing Ringer's solution into the abdominal vein. The lymph appears to be steadily returning blood proteins to the blood from the extravascular fluid. The same process is found in mammals although the circulation of lymph is much slower. The composition of lymph is the same as that of

dilute blood plasma.

Lymph-oedema can be produced experimentally and gives rise to the deposition of fibrous tissue in direct proportion to the completeness of the block. The oedema fluid contains protein which may reach the high figure of 5%. Regions affected by lymph block are very susceptible to infection. Thus, inoculation of a suspension of streptococci into an oedematous part in a dog gives rise to a sharp rise in temperature and in the leucocyte count whilst inoculations of the suspension into sound parts produce no reaction.

It is possible to find organisms in the lymphatics which have disappeared from the blood. It seems likely that, although proteins are passed to the lymphatics, antibodies injected into the blood may not pass in sufficient concentration into the lymph to be effective. The criterion then of an effective antibody is one of good diffusibility as well as high potency.

II. Lymph from the thoracic duct comes almost entirely from the intestine and not from the liver as was previously believed. It is richer in protein than lymph from other parts of the body, which is due probably to mechanical effects causing increased filtration rather than to an increased permeability of the capillaries of the villi. (The capillaries in all parts of the body are permeable to plasma proteins.) Lymph is formed from the tissue fluid, but as this has only been collected so far from the frog, it is impossible to say what its composition is in the mammal. In the frog it is identical with the lymph as regards protein. In experimental oedema produced by obstruction of the lymphatics in the leg of the dog, the oedema fluid is very close to that of the lymph. The function of the lymph appears to be the removal of the extravascular protein. The flow of lymph is closely related to activity; a free flow is obtained from a cannulated lymphatic in the leg when exercise is taken, but the flow drops at once when the leg is at rest. The flow of lymph from the heart is greatly increased following injection of adrenalin.—A. T. P.

French, M. H. (1939). **The Inorganic Phosphorus and Haemoglobin Levels of Native-owned Cattle in the Lushoto and Same Districts.**—*Rep. Dep. vet. Sci. Tanganyika, 1938.* Part II. pp. 78–79.

A survey of the cattle population made in the Lushoto district of Tanganyika showed that the spread of bush and bracken in the grazing areas is gradually resulting in overstocking without any means of control being taken. Inorganic P and Hb determinations on the blood of representative animals showed the P figures to be normal on the whole, although the absolute shortage of food during the dry seasons may be responsible for some of the reduced values found. There was also found in some animals the usual dry season anaemia. In the Same district a similar blood picture was found, although the dry season anaemia was sometimes masked by cases of trypanosomiasis. The available P of both areas was considered inadequate, but no detailed work was carried out.—Alfred Eden.

Smith, S. E. (1941). **Blood Glucose, Plasma Inorganic Phosphorus, Plasma Calcium, Hematocrit, and Bone Ash Values of Normal Minks (*Mustela vison*) and Foxes (*Vulpes fulva*).**—*Cornell Vet.* **31.** 56–62.

Blood was obtained by cardiac puncture from a total of 28 mink and 29 silver foxes, and was analysed by standard methods for one or more of the constituents named in the title.

The values obtained in the case of the mink were :– blood glucose, 122 ± 25 mg. per 100 ml.; plasma inorganic P, 3·93 ± 0·90 mg. per 100 ml.; plasma Ca, 10·68 ± 0·65 mg. per 100 ml.; erythrocyte volume (haematocrit), 55·5 ± 4·1. The rather high blood glucose values are attributed to struggling at the time of sampling.

For the silver fox, the corresponding values obtained were :– blood glucose, 104 ± 17 mg.; plasma inorganic P, 5·40 ± 0·86 mg.; plasma Ca, 9·84 ± 0·87 mg.; erythrocyte volume, 51·1 ± 2·7. The first three determinations (glucose, P, and Ca) were carried out on the blood of young animals (seven months of age) only.

The percentage of ash in the dry, fat-free femoral bones of 14 normal mink was 61·8 ± 1·1; that of the dry, fat-free ulnar bones of 13 young foxes was 64·8 ± 1·2.—A. N. W.

Haff, H. E., Smith, P. K., & Winkler, A. W. (1940). **Effects of Magnesium on the Nervous System in Relation to its Concentration in Serum.**—*Amer. J. Physiol.* **130.** 292–297.

Studies on the decerebrate cat and cats anaesthetized with sodium amytal were made to determine the relation between the concentration of magnesium in the serum and changes in reflex activity and in neuromuscular transmission. The order of disappearance of

reflexes after intravenous injection of Mg is correlated with the type and rate of discharge characteristic of the motor neurones comprising the motor element of the reflex arc. The reflexes with slow frequencies of discharge disappear first and those with higher frequencies later. Thus the greater the frequency of stimulation, the higher is the concentration of Mg necessary to block transmission. The results indicate that Mg affects muscular activity mainly through its action on the neuromuscular junction and not through its action on the central nervous system. It is pointed out that the curare-like action of Mg excess is, up to a point, the converse of the tetany of Mg deficiency.—R. ALLCROFT.

PHILLIPSON, A. T. (1939). **The Movements of the Pouches of the Stomach of Sheep.** —*Quart. J. exp. Physiol.* **29.** 395–415. [Author's conclusions copied *verbatim*].

1. The cycle of contraction in the reticulo-rumen sac of sheep is very regular, and occurs at intervals of 50 to 70 seconds. At times this interval is longer.

2. The reticulum has a two-stage contraction, the second contraction being superimposed upon the first. Varying degrees of relaxation often occur between the two stages.

3. The cycle of contraction in the rumen follows the two-stage contraction of the reticulum in a regular manner. Under certain conditions the rumen will continue to contract in an irregular manner when the contractions of the reticulum are at a standstill.

4. Either two or four contractions of the rumen occur to every two-stage contraction of the reticulum. These contractions are alternately in the dorsal and the ventral sac.

5. Variations of these cycles occurring frequently are two contractions followed by one contraction of the rumen to two consecutive two-stage contractions of the reticulum, and four contractions followed by two.

6. None of these cycles are absolute and all may break temporarily.

7. Changes in shape and position of the omasum can be seen radiologically. Blobs of barium and quick-moving trickles of barium have been seen to pass from the omasum to the abomasum. The passage of blobs occurs after a contraction of the reticulum, but the passage of the quick-moving trickles may occur at any time.

8. The body of the abomasum is lifted upwards in an anterior direction with each contraction of the reticulum, and its contents are moved towards the pyloric antrum. This action initiates waves of peristalsis in the pyloric antrum at regular intervals.

9. Barium can be seen in the duodenum within five minutes of feeding a barium meal to a young lamb from a bottle.

10. The interval of time between the contractions of the reticulum is increased after the lamb has drunk a meal of milk from a bottle.

11. The introduction of fluid directly into the abomasum through an abomasal fistula temporarily increases the interval of time between the contractions of the reticulum; if sufficient fluid is introduced, the contractions of the reticulum are stopped for longer periods, the length of which depends upon the amount introduced.

12. The application of direct pressure inside the abomasum by inflating a balloon placed inside that organ prevents contraction of the reticulum for apparently indefinite intervals so long as the pressure is maintained. This reflex supports the theory that food passes to the omasum and abomasum during every contraction of the reticulum, and indicates that the reticulum is the chief organ concerned with the onward passage of food through the stomachs.

[For the work 12 lambs were used which were fed barium sulphate for X-ray observations, five yearling sheep each with a fistula in the rumen and abomasum [see *V. B.* **11.** 409.], and a cow with a rumen fistula. In these last six animals, stomach contractions were observed and recorded graphically by a balloon-kymograph apparatus.]

DAY, F. T. (1939). **The Oestrus Cycle of the Mare Following Removal of the Foetus at Various Stages of Pregnancy.**—*J. agric. Sci.* **29.** 470–475.

Abortion was effected by manipulation and uterine irrigation in seven Welsh pony mares at periods corresponding in foetal age to 51–105 days. From the 6th–100th day after abortion each mare was tested daily with a "teaser" stallion to reveal the existence of oestrus, and during oestrus the time of ovulation was determined by rectal examination. The results are tabulated. Five of the mares came into oestrus between 5–25 days after abortion and two never came into oestrus during the observation period, which extended into the winter. Ovulation occurred on one of the last two days of oestrus in all of the five mares.—J. E.

LOONEY, J. M. (1940). **Sex Factors of the Adrenal Gland.** — *Endocrinology.* **27.** 511–520.

A review of the literature is given showing the close relationship that exists between the adrenal glands and sex factors. It has been known since 1856 that the adrenals are essential to life but information concerning the various functions of the gland, and isolation of the numerous hormones from it, is still far from complete. At present the evidence indicates that the substance essential to life present in the adrenals does not of itself affect the gonads, but that certain cortical extracts have a marked effect on the sexual development of experimental animals; it therefore appears that there are present in the adrenal gland substances distinct from cortin which have gonadic activity. The direct isolation of oestrone and progesterone from adrenal glands leaves no doubt that the glands are a source of sexual hormones.—R. ALLCROFT.

MARLOW, H. W., & RICHERT, D. (1940). **Avian Estrogens and Blood Calcium.**—*Endocrinology.* **27.** 274–278.

Injections of immature ova, follicle extract and ovary extract into pullets 12–14 weeks old had no significant effect on the normal level of the blood Ca.—R. ALLCROFT.

TECHNIQUE AND APPARATUS

EHRINGER, G. (1940). Culture en anaérobiose. Fermentations sucrées. Stérilisation à basse température. **[Anaerobic Culture Technique. Sugar Fermentations. Low Temperature Sterilization].**—*Pr. méd.* **48.** 335–337.

E. describes a cheap simple glass apparatus, easily blown, which can be fitted on to tubes, Erlenmeyer flasks, Roux and Pinoy bottles, etc. Oxygen is removed by one of the standard methods (alkaline pyrogallol, Na hydrosulphite, growth of an aerobe in broth).

For routine work on sugar fermentation reactions, stocks of the solutions in meat-extract peptone broth can be put up in small ampoules which are sealed off after low temperature sterilization by discontinuous heat. Other media not in daily use can likewise be kept sterile in ampoules until required for use. Low temperature sterilization by discontinuous heat is described. The whole of the technique discussed is adapted for use in routine work in laboratories where economy in labour, material, and apparatus is essential.—ALFRED EDEN.

NELSON, C. I. (1940). **Buffered Blood Cultures.**—*J. infect. Dis.* **66.** 113–116.

The difficulties associated with detecting the presence of bacteria in blood by cultural methods are obviated by the use of citric acid-disodium phosphate buffers of pH 7·4 and 7·6 to which quantities up to 5 c.c. blood are added aseptically. The added blood supplies its own nutrients and the time required for growth is a matter of hours as compared with days for many other blood culture media. Results are reported of use of this buffered blood medium in cases in which bacterial invasion of the bloodstream was a strong possibility. Though the growth of organisms was found in the blood in connexion with certain diseases of man, the data are offered without any claim for aetiological specificity in any particular disorder or infection.—ALFRED EDEN.

MISCELLANEOUS

I. —. (1940). **Committee Report on the Summarization of Laws and Regulations Governing the Inter-state Movement of Live Stock.**—*Proc. 43rd ann. Meet. U.S. Live Stk sanit. Ass., 1939.* pp. 256–271.

II. —. (1940). **Report of Committee on Resolutions.**—*Ibid.* pp. 271–274.

III. —. (1940). **Report of the Committee on Legislation.**—*Ibid.* pp. 296–298.

IV. —. (1940). **Report of the Committee on Policy.**—*Ibid.* pp. 298–299.

I. Because of the increasing adverse criticism of the inter-state trade barriers which interfere with the movement of livestock in the U.S.A., this committee was formed to collect data on the existing federal and state regulations governing the movements of livestock with reference to tuberculosis, glanders, brucellosis, and sheep scab, and the inter-state movement of swine for purposes other than immediate slaughter.

This report summarizes the data, partly in tabular form; it does not lend itself to abstracting.

The committee further considered the advisability of having uniform state regulations, but concluded that the idea was impracticable and unlikely to achieve the desired effect.

II. The committee presented four resolutions preceded by explanatory preambles, stating the desirability of (1) founding a state animal disease control organization; (2) creating a general and uniform meat and meat products inspection service; (3) founding a slaughter poultry inspection service, and (4) making the Association's publications available to the medical and agricultural interests in North America.

III. The committee collected information on new federal and state legislation pertaining to the control of animal diseases. They speak of the necessity for the unification of state regulations for the control of bovine brucellosis.

IV. The committee commended the Bureau of Animal Industry for preparing a standard *Brucella abortus* antigen for official herd tests, called attention to the need for co-ordinating meat inspection and animal disease control, requested the B.A.I. to publish a monthly newsletter on the disease situation in the U.S.A. and abroad, deplored the lack of uniformity in inter-state regulations on the movement of livestock, called for a more scientific method of controlling bovine brucellosis, to include calfhood vaccination, and moved that further study to this end be taken in hand by the B.A.I. and by agricultural experiment stations.—J. E.

CHIEN, T. H. (1935). **The National Agricultural Research Bureau.**—*China Critic.* **11.** No. 10. Reprint pp. 13.

This bureau was founded in 1933 for the purpose of developing the agriculture of China. The Department of Animal Husbandry and Veterinary Science was formed to conduct research and training classes, establish epizootic prevention centres, manufacture veterinary biological products and collect and file veterinary literature and specimens. It has been estimated that the annual loss from animal disease in China is over $100,000,000, and as livestock products rank high among China's exports, a reduction in animal losses would mean an expansion of her foreign trade and an increase in the buying ability of the farmers as a whole.

BURTT, B. D. (1939). **A Field Key to the Savanna Genera and Species of Trees, Shrubs and Climbing Plants of Tanganyika Territory. Part 1: Genera and some Species.** pp. xvi + 53. Dar es Salaam: Govt. Printer. [8vo] [Shs. 2/-].

This publication contains a key by the use of which it should be possible to identify the genus of the various trees, shrubs and climbing plants of tropical Africa. A glossary of the botanical terms used is included, so that it should be useful even to a comparative novice in botany. This book will make it possible for veterinary surgeons working on diseases transmitted by biting flies and ticks to record with reasonable accuracy the type of flora encountered in connexion with the various disease outbreaks.

—U. F. RICHARDSON.

—. (1941). **Maintenance of Pure Genetic Strains of Animals and Plants.**—*Arch. Path.* **31.** 131. [Copied *verbatim*].

The Division of Biology and Agriculture of the National Research Council, Washington, D.C., has set up a committee to promote the maintenance of pure genetic strains of animals and plants needed for investigative purposes in medicine, genetics and related fields.

PIRIE, N. W. (1940). **The Criteria of Purity used in the Study of Large Molecules of Biological Origin.**—*Biol. Rev.* **15.** 377–404.

The criteria of purity are discussed in relation to the group of substances such as proteins, polysaccharides, viruses etc. referred to as large molecules. It is concluded that "purity" is a concept that has no meaning except with reference to the methods and assumptions used in studying the substances under discussion. It is pointed out that four distinct meanings can be implied by the word "pure" when applied to a preparation that has a measurable activity, *e.g.* an enzyme, an antigen, or a virus; examples are given of each type of purity. The observations usually made and presented as evidence of the purity of a substance are considered under seven headings:– chemical analysis, crystallinity, specific serological reaction, measurements of activity and of precipitation or infection end-points, ultracentrifugation, electrophoretic measurements, and studies based on the principles of the Phase Rule. The first two methods are the least reliable; specific serological tests can only show the absence of contaminants whose presence is suspected, and the measurement of end-points, whether by serum precipitation or infection, is subject to several errors. The last three methods give the most reliable evidence of

purity at present available, but there are reasons for thinking that even these may be fallible.—R. ALLCROFT.

HALVORSON, H. O., & ZIEGLER, N. R. (1933). **Application of Statistics to Problems in Bacteriology. III. A Consideration of the Accuracy of Dilution Data Obtained by Using Several Dilutions.**—*J. Bact.* **26.** 559–567. [For previous parts, see *V. B.* **5.** 52].

ZIEGLER, N. R., & HALVORSON, H. O. (1935). **Application of Statistics to Problems in Bacteriology. IV. Experimental Comparison of the Dilution Method, the Plate Count and the Direct Count for the Determination of Bacterial Populations.** —*Ibid.* **29.** 609–634.

HALVORSON, H. O., & MOEGLEIN, Alice. (1940). **Application of Statistics to Problems in Bacteriology. V. The Probability of Occurrence of Various Experimental Results.**—*Growth.* **4.** 157–168.

III. Continuing their studies on the estimation of the number of bacteria in a suspension the authors present statistical evidence in favour of their thesis that when three effective dilutions are used to determine a bacterial population the accuracy depends solely upon the number of tubes used in each dilution and is independent of the actual number of bacteria involved. By use of the formulae previously given, tables and graphs have been constructed, and from these data it is possible to estimate the number of bacteria in a population and to be 97% certain of the limits within which the actual value lies. Details are given of the method for evaluating the accuracy of data when three dilutions are used, and the text is illustrated with a specimen calculation.

IV. Comparisons were made of the results obtained for assessing a bacterial population using the plate count, the direct count, and the dilution methods as outlined above. Direct counting gave significantly higher values than the dilution and plating methods which closely agreed. When mixed cultures are encountered, the antagonistic action of one species for another renders the plating method less reliable, and in such cases the dilution technique offers a new method for the determination of this antagonistic effect. The pure cultures examined were those of *Bacterium coli*, *Bacillus subtilis*, *Pseudomonas pyocyanea* and *Staphylococcus aureus*, and the mixed cultures studied included *B. coli* and *Ps. pyocyanea*, *B. coli* and *Staph. aureus*, and the mixed culture found in packing house curing pickle.

V. A description is given of the dilution method for assessing a bacterial population and recommendation is made for the use of at least ten tubes for determining the growth at each of three dilutions. In the determination of bacterial populations by the dilution method, using ten tubes in each of three critical dilutions, calculations have been made of the probability of occurrence of various combinations of tubes showing growth and no growth. Full details of the statistical methods employed in these investigations are given in the text.

—ALFRED EDEN.

OFFICIAL AND OTHER REPORTS

TANGANYIKA TERRITORY. (1939). **Annual Report of the Department of Veterinary Science and Animal Husbandry 1938. Part I.—Routine Activities and Normal Progress of the Department.** [LOWE, H. J.] pp. 60. Dar es Salaam: Govt. Printer. [fcp] [Shs. 4/–].

It was decided to issue this and future annual reports from this Department in two parts, part I to deal with routine activities and normal progress, and part II to deal with research.

The year was an unfortunate one for stock, owing to the relative failure of the rainy seasons, and cattle died in large numbers from starvation.

EAST COAST FEVER caused serious losses amongst European herds in the northern and southern highlands provinces, and farmers have begun to realize that no considerable development of cattle is possible until this very serious disease is under control. The necessary legislation was submitted to Government during the year, to ensure compulsory dipping in the most affected areas. In native areas this disease caused the usual heavy mortality, but in certain township areas the effects of regular and efficient dipping began to be apparent.

The RINDERPEST position became very serious in the southern part of the Territory, but the special measures taken to meet it appeared to be successful, and, for the time, danger of the spread of the disease to the territories south of Tanganyika was avoided.

BOVINE CONTAGIOUS PLEURO-PNEUMONIA caused considerable anxiety during the year.

Epizootics of ANTHRAX and RABIES were recorded and TUBERCULOSIS appeared to be on the increase. SARCOPTIC MANGE in goats, FOLLICULAR MANGE in cattle, and STREPTOTHRICOSIS did serious damage to the hide and skin trade. BLACKLEG, CONTAGIOUS ABORTION, TRYPANOSOMIASIS, ANAPLASMOSIS, PIROPLASMOSIS, FOOT AND MOUTH DISEASE, and THREE DAY SICKNESS are other diseases dealt with.

Heavy WORM INFESTATION is a more serious problem in sheep than in any other domestic animal. *Haemonchus contortus*, *Oesophagostomum columbianum*, and in swampy areas *Fasciola hepatica* or *F. gigantica*, are the most important parasites. Regular dosing, frequent changes of pasture and kraals, and the maintenance of a high level of nutrition, are necessary to avoid serious losses.

It is considered that the general position of animal health deteriorated during the year.

The importance of educating the native owner to a standard where he will be able to realize the value of the advice given to him by the technical departments, is stressed. No progress, for example, is possible as long as overstocking with consequent soil erosion remains. It is obviously a waste of time and money to provide water and grazing if herds tend to increase indefinitely. This question, which remains a major problem, is, however, closely bound up with native customs and care is required in handling it.

There was a serious fall in the value of the hides and skins exported from the Territory owing to unsettled world markets. The clarified butter industry however flourished during the year, and local demand far exceeded supply.

More than 95% of the livestock in the Territory is owned by natives, but great strides have been made by European farmers. Flourishing dairy and pig industries have been established. During the year, officers of the department toured European settled areas and gave instruction in various matters pertaining to animal husbandry.

Approximate figures of the LIVESTOCK CENSUS are :– 5,000,000 cattle, 1,850,000 sheep, 3,000,000 goats, 10,350 pigs, 54,400 donkeys, 135 horses, and 33 mules.

The professional staff at the end of the year consisted of 12 veterinary officers including the director of veterinary services and the officer in charge of the laboratory. There were also 23 European technical assistants, livestock officers etc. There appears to be some justice in the claim made in this report, that the number of staff is woefully inadequate, considering the size of the Territory (some 365,000 sq. miles), the number of cattle (about 5,000,000), and the great variety of diseases met with.

—A. H. MILNE.

BOOK REVIEWS

ANTHONY, D. J. [M.R.C.V.S., D.V.S.M. (Vict.)]. (1940). **Diseases of the Pig and Its Husbandry.** pp. xi + 272. 48 figs. London : Baillière, Tindall & Cox. [8vo] [10s. 6d.]

In view of the author's extensive experience of one branch of the pig industry, it is disappointing that this manual contains so little that is original.

Chapter I is headed " Some Breeds of Pigs ", and comprises an abridged version of the information included in the *Ministry of Agriculture and Fisheries Bulletin*. No. 86, together with a few notes on foreign breeds. Chapter II deals with the requirements for breeding and for the pork market and bacon trade. Such material as it contains is, as would be expected, excellent, but the whole of this important subject is disposed of in a mere six pages. Chapter III is on breeding and management. Chapter IV deals briefly with feeding. There follows a short chapter headed " Dentition and Ageing ", which includes also a few notes on temperature, respiration, the signs of health and restraint. In Chapter V, the scheduled diseases are described. It is perhaps typical of the whole book that whereas swine fever, by far the most important of all infectious diseases of pigs in this country, is dealt with in less than eight pages—one of which is largely taken up with the single illustration—the description of rabies occupies nearly two pages, and includes a 3½ line reference to the particle size of the rabies virus ; when dealing with Aujeszky's disease in another chapter, the author discusses the size of the virus in even greater detail. Chapter VI deals with a considerable number of " constitutional diseases ", including tuberculosis, Aujeszky's disease, swine pox, pig paratyphoid, swine erysipelas, swine influenza, tetanus, bacterial necrosis, and " contagious abortion ". The section on TB,

includes the important observation that the writer has found TB. lesions in approximately 11% of 1,452,779 pig carcasses of all ages from various parts of the British Isles.

Deficiency diseases form the subject of the next chapter. Chapters IX to XII, comprising nearly 70 pages, deal with "local diseases". The illustrations are good, but there seems little point in devoting several pages to a discussion of urine testing, and much of the matter based on pathological literature, rather than on practical considerations, might well have been omitted. The next chapter, dealing with parasitic diseases, is also lacking in balance. It would have been of value to have recorded the incidence of such conditions as they are encountered in the abattoir.

The last chapter deals with poisons and poisonous plants, and here also the material is mostly annotated from standard works. There are only one or two case reports, and, at the end, over a page is devoted to "anaphylactic shock" without any reference to the species under consideration.—A. N. WORDEN.

PRENTISS, A. M. (1937). **Chemicals in War. A Treatise on Chemical Warfare.** pp. xviii + 739. New York & London: McGraw-Hill Book Company, Inc. [8vo] [45s.]

The reason for drawing attention to this book four years after its publication is the present interest of the subject matter and the paucity of comprehensive treatises in the English language on the subject of chemical warfare. The variety of information contained in it should ensure a place on the reference shelves of relevant libraries.

Its main purpose is to render available a text on what the author regards as a much misunderstood and misrepresented subject, and the material is presented in five parts. Part I deals with basic principles and definitions, technical and tactical requirements for chemical agents, methods of dissemination, and military organization for chemical combat. Part II deals with classification of agents according to chemical, physical and physiological properties, and to military use. Successive chapters deal with lachrymatory agents, lung injuriants, systemic toxic agents, vesicants, respiratory irritants, smoke agents and incendiaries. Part III covers the technique and tactics of chemical warfare, including general objectives, tactics of infantry and special gas troops, of artillery and air corps. Part IV considers defence against chemical attack, individual and collective protection, tactics of protection in battle, chemical intelligence service, and protection of civil population. Part V deals with the relation of chemical industry to chemical warfare, effectiveness and philosophy of such warfare, and international attempts to restrict it. The view is taken that neither on grounds of logic nor humanity is there any reason to repudiate chemical methods of warfare rather than any other methods. Indeed it is more humane than high explosives and there is much scope for effective use. By chemical means alone can the blow be tempered to the end in view and any desired effect be produced, from simple lachrymation to immediate death.

The volume carries a useful bibliography and a good index.—H. H. GREEN.

LAKHOVSKY, G. (1939). **The Secret of Life. Cosmic Rays and Radiations of Living Beings.** pp. viii + 201. 22 figs., 6 plates, 2 tables, 1 appendix. London: William Heinemann (Medical Books) Ltd. [8vo] [10s. 6d.]

The novelty of this book, sponsored by PROFESSOR D'ARSONVAL in a short preface and expounded in an introduction by the translator of the original French version, will appeal to speculative minds although much of the subject matter will not escape criticism from orthodox biologists. According to the author the living cell may be compared to an electrical oscillating circuit, the nuclear filaments being endowed with "self-inductance" and "capacity" and therefore capable of oscillating according to specific frequencies. The fight between higher organisms and microbes is fundamentally a "war of cellular radiations". Health is equivalent to oscillatory equilibrium and disease is characterized by oscillatory disequilibrium. The luminescence of the glow worm is an example of vital radiation perceptible to the visual sense, but a wide gamut of radiations exists both above and below the wave-lengths of the visible spectrum.

The contents of the book cover a wide range, from a discussion of instinct and special directional sense in birds and other animals, to cosmic radiations in relation to health. Chapter 10 deals with the "therapeutics of cellular oscillation" and a description of the "multiple wave oscillator" is given in the appendix, along with clinical reports on cases treated with it in recognized hospitals.

—H. H. GREEN.

INDEX VETERINARIUS

The publication of *Index Veterinarius* commenced with the indexing of the literature of 1933. It is a complete index of current publications relating to veterinary research, public health, administration, education and other aspects of veterinary science.

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